

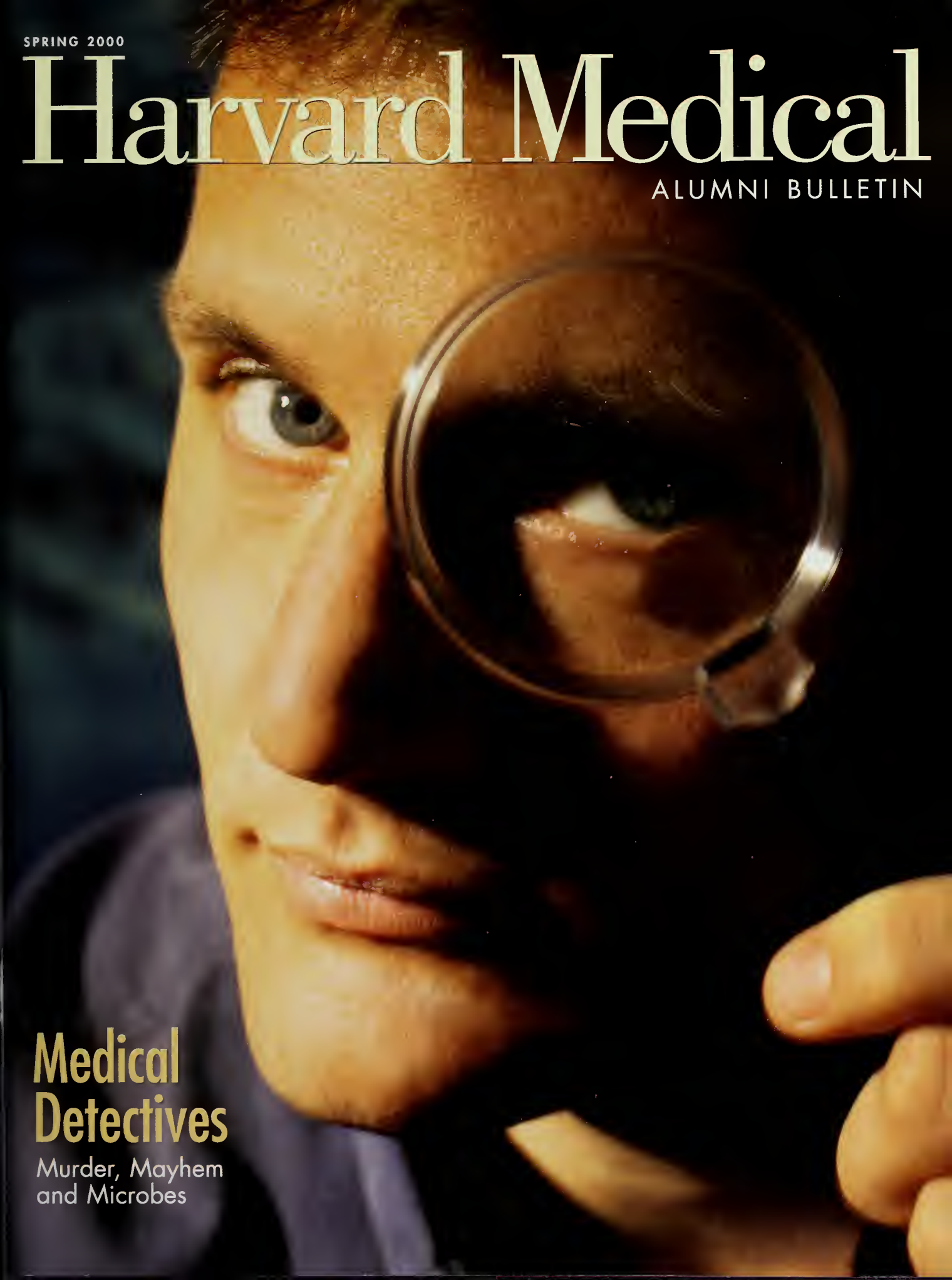
SPRING 2000

# Harvard Medical

ALUMNI BULLETIN

## Medical Detectives

Murder, Mayhem  
and Microbes





LANDMARK

1889

The first operation to take place in the Bradlee Ward of Massachusetts General Hospital. This aseptic ward had been built the previous year to accommodate abdominal and brain surgery.



# CONTENTS



## DEPARTMENTS

Letters.....	3
Pulse.....	8
Faculty spoofs from the second year show; a new look at the importance of biodiversity; HMS maintains a tradition	
President's Report.....	10
by Sharon B. Murphy	
Bookshelf.....	11
Benchmarks.....	12
Evidence points to a genetic expansion behind vertebrate fingers and toes.	
by Misia Landau	
Class Notes.....	58
In Memoriam.....	62
George Starkey	
Obituaries.....	63
Endnotes.....	64
Who taught Sherlock Holmes to detect clues as subtle as a calloused thumb?	
by Paula Byron	

## MEDICAL DETECTIVES: MURDER, MAYHEM, AND MICROBES

### A Single Strand.....14

Forensic detectives are bringing new scientific tools into the courtroom to unlock decades-old secrets.

by PHYLLIS L. FAGELL

### Body of Evidence.....24

A physician applies his knowledge of the dead to help the living.

by BEVERLY BALLARO

### Microbe Hunter.....28

In chasing outbreaks around the globe, an epidemiologist encounters the sublime and the surreal.

by BEVERLY BALLARO

### Dead Men Do Tell Tales.....32

Deciphering the encryptions of the dead requires knowing how to read a body.

by BEVERLY BALLARO

### The Tell-Tale Heart.....36

An infectious disease expert investigates how human attitudes and behaviors can promote—or imperil—a healthy society.

by BEVERLY BALLARO

### Murder Most Harvard.....40

A brutal slaying at Harvard Medical School led to one of the world's first applications of forensic evidence in court.

by ANTHONY S. PATTON

## FEATURES

### Babies in Saddlebags.....48

A surgeon recounts his adventures working alongside nurse-midwives in one of the poorest and least accessible areas of the United States.

by FRANK J. LEPREAU, JR.

### Special Deliveries.....54

The challenge of ensuring a healthy beginning for babies is heightened in the resource-deprived Balkans.

by CHRISTINA ANDERSON



Cover photograph: John Brooks '94, an Epidemic Intelligence Service officer at the Centers for Disease Control and Prevention, tracks outbreaks around the world. Photograph by Lynne Siler.

## In this Issue

**I**T IS NOW 150 YEARS SINCE PROFESSOR JOHN WEBSTER WAS SENTENCED to hang for the murder of Dr. George Parkman, whose body parts were once stowed here and there around Harvard Medical School. In this issue of the *Bulletin* we revisit that grisly crime. We also join several alumni and faculty in looking at more recent crimes and the ways they were solved using forensic techniques both new and ancient.

An issue on medical detectives must be quite selective, as all physicians are detectives at one time or another. Diagnosis is detection, and the affiliation of medicine with detective fiction is ever present. (You may recall that we meet Sherlock Holmes, the most famous of all fictional detectives, when two physicians join him in a laboratory, where he demonstrates an exquisitely sensitive method to detect blood stains. More about Holmes and his physician creator, Sir Arthur Conan Doyle, on the last page.) There's a certain breed of medical gumshoe, the shoe-leather epidemiologist, who shares both footwear and certain investigative methods with the more classical form of detective. Two of these detectives also are featured in the current issue.

How people wind up doing what they do is a mystery that can rarely be solved, but part of the intrigue of this issue is the occasional clue scattered in the life histories of its subjects. One of our epidemiological detectives read *Microbe Hunters* at a suitably impressionable age. At the same age, another was provided a cadaver to dissect by her mother. One of our medical examiners, who has a Holmesian turn of mind, noticed as a young boy the peculiar imprint left by coral striking flesh and would use that memory decades later to help solve a crime. And one of our authors, a physician turned historical essayist, defied maternal disapproval to attend HMS. More than a century after the Parkman murder, his mother worried that its legacy made the School unsuitable and unsafe for her son. There's the power of history.

One thing is not a mystery about the *Bulletin*. This year we have received three national awards from CASE, the Council for Advancement and Support of Education: a gold medal to mark us as a leader among magazines published by professional and graduate schools, as well as those that cover research, science, and medicine; a gold medal for last summer's issue on music and medicine; and a silver medal to recognize our recent changes in format. This recognition is due to the editorial vision of Paula Byron, editor of the *Bulletin*; the reportorial skills of our associate editor, Phyllis Fagell; the lively writing of Beverly Ballaro, our assistant editor; and the artistic sensibilities of our design director, Laura McFadden. It is due also to the alumni whose articles in the *Bulletin* make it distinctive among publications of its kind. Thanks to all of you.

*William Ira Bennett*

EDITOR-IN-CHIEF  
William Ira Bennett '68

EDITOR  
Paula Brewer Byron

ASSOCIATE EDITOR  
Phyllis L. Fagell

ASSISTANT EDITOR  
Beverly Ballaro, PhD

BOOK REVIEW EDITOR  
Elissa Ely '88

EDITORIAL BOARD  
Elissa Ely '88  
Robert M. Goldwyn '56  
Joshua Hauser '95  
Paula A. Johnson '84  
Perri Klass '86  
Victoria McEvoy '75  
James J. O'Connell '82  
Gabriel Otterman '91  
Deborah Prothrow-Stith '79  
Guillermo C. Sanchez '49  
J. Gordon Scannell '40  
Joshua Sharfstein '96  
Eleanor Shore '55  
John D. Stoeckle '47

DESIGN DIRECTOR  
Laura McFadden

ASSOCIATION OFFICERS  
Sharon B. Murphy '69, president  
Charles J. Hatem '66, president-elect 1  
Paul J. Davis '63, president-elect 2  
Stephen G. Pauker '68, vice president  
Maria C. Alexander Bridges '80, secretary  
James B. Field '51, treasurer

COUNCILLORS  
Claire V. Broome '75  
Paul Farmer '90  
B. Lachlan Forrow '83  
Michael A. LaCombe '68  
Eric B. Larson '73  
Gina Moreno John '94  
Deborah J. Oyer '87  
DeWayne M. Pursley '82  
Morton N. Swartz '47  
Nanette Kass Wenger '54

DIRECTOR OF ALUMNI RELATIONS  
Daniel D. Federman '53

ASSISTANT DEAN FOR ALUMNI  
AFFAIRS AND SPECIAL PROJECTS  
Nora N. Nercessian, PhD

REPRESENTATIVE TO THE  
HARVARD ALUMNI ASSOCIATION  
Chester d'Autremont '44

The *Harvard Medical Alumni Bulletin* is published quarterly at 25 Shattuck Street, Boston, MA 02115 © by the Harvard Medical Alumni Association.  
Phone: (617) 432 1548 • Fax: (617) 432-0013  
Email: bulletin@hms.harvard.edu  
Third class postage paid at Boston, Massachusetts. Postmaster, send form 3579 to 25 Shattuck Street, Boston, MA 02115  
ISSN 0191 7757 • Printed in the U.S.A.



## The Monkey and the Blue Dress

Lewis Barness's article in the spring 1999 issue of the *Bulletin*—"Pediatric Care Fifty Years Ago"—was superb. It brought back a flood of pleasant memories of long ago.

I graduated from HMS in 1933, worked with Sidney Farber for three months on the pathology of transpositions, and then spent three months as an intern at the House of the Good Samaritan. In 1935, I began a pediatrics residency at Children's Hospital in Boston.

At that time, the Good Samaritan only admitted patients with rheumatic fever—up to adolescence for males and at all ages for females. Unfortunately, the etiology of rheumatic fever was still obscure and there were no effective therapies. As Barness wrote, sunshine and a warm climate were thought to be beneficial, and each winter the Good Samaritan would send some of the more severely afflicted children to a hospital in Florida. This treatment seemed to help until one year, when there was an epidemic of sore throats and many of those children had severe recrudescences, necessitating a quick return to Boston by train and bus, as there were no planes available.

In those days, the sed rate was our final criterion for when a child could be excused

from complete bed rest. The patients quickly realized this, and whenever I appeared with the IV tray, they would all immediately hold out their arms and beg, "Please stick me, please"—even down to a five-year-old girl, Virginia L., who had already had several attacks of rheumatic fever and was one of the youngest children ever admitted to the Good Samaritan.

In the evenings, after the children had gone to sleep, the intern made "breathing rounds"—going from bed to bed listening to the pattern and frequency of each child's respiration—and tucking in others who were still awake. At that time, salicylates were pushed to subtoxic levels in the hope that they might affect the disease and cardiac manifestations as they did the arthritis and fever (though not the chorea). The "breathing rounds" were to detect hyperpnea, one of the earliest signs of salicylate toxicity.

The House of the Good Samaritan, its staff, and particularly its patients were the best educators I have ever had—educators in the sense of leading (or forcing) one to learn, to read, and to delight in advances in knowledge. These "lessons" have persisted 66 years later, as has the awareness of the deficiencies in our knowledge.

It is difficult to imagine today how close the bonds were between the staff and patients at the Good Samaritan, because the patients were there for such long periods of time. I am enclosing some doggerel that I composed at the Good Samaritan in late 1933. I wrote it for a young girl, Olive B., when T. Duckett Jones transplanted a rheumatic fever nodule from her to a monkey to try to learn more about the disease. Olive had severe rheumatic fever—and a favorite blue dress. The delight she felt when I read the poem to her still affects me deeply, for she died a short time later.

### OLLIE AND THE MONKEY

*The time has come, the interne said,  
To talk of many things.  
Of colds, and throats, and nodules firm  
And why the heart doth sing.*

*That brings to mind, the doc opined,  
The case of Ollie B.  
The growth of lumps and fever high  
Is her propensity.*

*One day anew, some nodules grew  
Upon her wrist and knee.  
Professors wise from miles around  
Did come, these lumps to see.*

*With scalpel bright they long did fight  
This nodule: to dissect,  
And in a monkey named Old Fish  
The same small lump inject.*

*The monkey vowed in cries quite loud  
The node was like a pearl;  
The node replied it could not tell  
The monkey from the girl.*

*But I did strike—they're not alike!  
That statement is not true!  
The girl alone, and not the monk,  
Looks good when dressed in blue.*

"The heart doth sing" referred to our practice of telling the children that, when auscultating, we were listening to their hearts singing.



**A PLACE IN THE SUN:** In the mid-1930s, when this picture was taken, rheumatic fever patients at the House of the Good Samaritan would receive sun treatments.

In the summer of 1935, we had a severe polio outbreak, so the *Bulletin's* picture of the monster Drinker respirator also brought back many memories. At Children's Hospital, we used to go into the respirator—quickly to avoid interfering with the children's respiration—to examine and take care of the children. Once inside, the changes in pressure were hardly noticeable. Again there was no knowledge of the cause, treatment, or prevention of polio.

One child, Helen R., was admitted with severe bulbar signs, high fever, and rapid pulse—signs of a quick and fatal outcome. Every time I tried to clear Helen's throat with a suction tube, she fought to exhaustion. It soon became evident, however, that Helen would die

from aspiration pneumonia unless we found a better way to prevent it. After much persuasion, to the point of being obnoxious, I convinced the staff to do a tracheostomy. At that time, no tracheostomies had been done for polio at Children's Hospital, and had only been done sporadically elsewhere. The surgeons insisted on doing the tracheostomy under local anesthesia. I well remember the fright of that poor child during the operation. Fortunately, she did not remember the operation afterward. Aspiration and pneumonia could now be prevented, and Helen recovered from both the tracheostomy and the polio without obvious sequelae.

Before the tracheostomy tube was removed, I asked Helen if we could suction it before a camera, thinking we might be able to use the film to reassure parents of children with similar problems. The suctioning brought tears to Helen's eyes, but when it was finished, she gave a bright and unforgettable smile through her tears. I don't know whether the movie was ever used, but I'm sure that no one in that room ever forgot that tearful but happy smile.

As the song goes, "thanks for the memories!"

JEROME HARRIS '33  
DURHAM, NORTH CAROLINA

### Miracles on Binney Street

Benedict Massell's letter to the editor in the autumn issue recalled poignant memories for me of the House of the Good Samaritan, Dr. Massell '31, Dr. T. Duckett Jones, and the many children with active rheumatic fever. The year was 1944, my junior year at HMS, when I served as a student intern with Tom Macklin, who was in his senior year. We made rounds twice daily and wrote all the orders on those 80-odd children, under

the stimulating and wise counsel of Drs. Massell and Jones.

Two memorable events took place during my tenure. One day, having made rounds twice and having examined all the children, I sat down for dinner with Miss Hussey, RN—the director of the hospital—and other staff members. She noted that I had a rash, which was quickly diagnosed as measles. When notified, Dr. Jones immediately had me transferred to the Harvard Infirmary, lest I endanger any more children. The records revealed that over half of the children had never had the measles. This potentially lethal crisis led Dr. Jones to contact authorities in Washington responsible for the distribution of gamma globulin during the war. They immediately arranged to have this scarce plasma fraction shipped to Boston. Fortunately, all the children at risk were able to get the protection they needed and none developed measles.

On another occasion, Bobby H., a four-year-old boy with severe rheumatic heart disease, developed acute bacterial endocarditis with a temperature of over 105°. Dr. Jones prevailed on Chester Keefer, chairman of the Committee on Chemotherapeutics of the National Research Council—also known as the "penicillin czar"—to release some precious reserve from the wartime stockpile. Since penicillin was in such short supply and was used primarily for the Armed Forces, little was available for the civilian population. With this gift of penicillin, Bobby made a dramatic recovery. To my knowledge, he was the first child, if not person, to receive penicillin for the treatment of bacterial endocarditis. So scarce was penicillin at this time that attempts were made to extract it from the urine of treated patients and reuse it.

This stimulating year at the Good Samaritan directed me into the field of rheumatic diseases. I was on the "lupus" team of physicians at Mt. Sinai Hospital in New York in the late 1940s. This was the first group in the United States to be given access to cortisone to perform clinical studies in the treatment of systemic lupus







**WARTIME HEALING:** The House of the Good Samaritan in 1944

erythematous. Chester Keefer again was responsible for the allocation of this new drug to research specialty groups throughout the country. Later, while doing biochemical and clinical research at the National Institutes of Health, I had the good fortune to work in the Bunim group when they were given the first and exclusive use of prednisone and prednisolone for clinical research in rheumatoid arthritis. These were exciting times with some of the early "miracle" drugs.

When I returned to Boston for my 50th medical school reunion in 1995, I was saddened to learn that I could not revisit the House of the Good Samaritan on Binney Street. It had been demolished years earlier.

NORMAN F. BOAS '45  
MYSTIC, CONNECTICUT

## Leveling the Playing Field

I want to express my gratitude to the *Bulletin* for publishing the autumn issue with its focus on progress in recruiting women and people of color to HMS, both students and faculty. I was keenly aware during my medical education and training that women and minority groups were vastly underrepresented and not always treated with respect. I have continued to be fully supportive of the goals of the civil rights and women's rights movements over the years, especially as they have played out in affirmative action programs. As more women and minorities enter medical practice, teaching, and research, the quality of care provided to women and minority persons is improving. As highlighted by both Derrick Bell and David Satcher,

this nation still has a long way to go in leveling the playing field for all races and both sexes. I applaud the ongoing efforts of HMS to do just that in the field of medicine.

THOMAS WASHBURN '57  
BRADENTON, FLORIDA

## Alone Among the Ivys

The autumn issue of the *Bulletin* reminded me of something I had read that made me proud of HMS. The July 22, 1999 issue of *Black Issues in Higher Education* reviewed the standings of medical schools in relation to educating African Americans, Hispanics, Asian Americans, and Native Americans.

Harvard is the only Ivy League medical school to appear on the list. We rank fifth for African Americans and second if you discount the three historically African American medical schools. The program held last June that celebrated 30 years of affirmative action at HMS would have been greatly enhanced if these data had been available. By making a conscious effort, we can make a real difference.

We are 18th in educating Hispanics and 15th in educating Asian Americans, again alone among the Ivys to be ranked. This is important information and should be made available to those communities we want to target.

JAY M. JACKMAN '64  
ITHACA, NEW YORK

## The Role of Students

Some months ago, Ed Hundert '84 suggested that I contact you about a historical question that the *Bulletin's* article on affir-

mative action at HMS in the autumn issue raised anew for me. Please let me know if you can help me clarify an issue about the sequence of events at HMS in 1968, when I was a second-year student.

My recollection is that Noel Solomons, the only African American in the Class of 1970, and I had petitioned Dean Robert Ebert, with the support of a number of fellow students, to address race issues at HMS. Dean Ebert, as was his style, responded appreciatively and appointed a "faculty commission" to pursue the subject. Shortly thereafter, the assassination of Dr. Martin Luther King, Jr. led to the sequence of events described in the *Bulletin*, and the "commission" either became or was replaced by the initiative of the faculty members mentioned in the *Bulletin*.

The point I wish could be better made, with real evidence behind it, is not which individual students were involved at the time, but rather the reality that the students led the faculty on these matters, and the *Bulletin* article, as well as the plaque in the lobby of Building A at HMS, ignores this aspect of the story entirely. The point that students can influence events in the real world is one that Dr. Hundert agrees needs to be emphasized for today's cohort of students.

I have the highest respect and admiration for the HMS faculty who have been appropriately honored for their initiatives and accomplishments in this area. They were truly our inspiration academically, but if you ask them, I think they might concur that the students took more of the initiative than the now semi-official version of the history of that period acknowledges.

JOSEPH H. ALBECK '70  
BELMONT, MASSACHUSETTS

## Standing Up for What Was Right

I have read the article on "Thirty Years of Affirmative Action" in the recent *Bulletin*. I have also previewed the commentary by my classmate Dr. Joe Albeck, in which I have been correctly singled out as the only African American member of the Class of '70. Depending upon whether you count

the 30 years from 1969 and the beginning of affirmative action at HMS, or the three decades of graduates to the end of the century, I am either at the top of the pyramid, or on the bottom of the totem pole in relationship to the affirmative action era.

To read the article in the recent issue of the *Bulletin*, it would almost seem as if Martin Luther King, Jr. died so that 717 minority graduates of the dental and medical schools might live, and matriculate. A score and twelve years can put a lot of haze into the memory of the primary protagonists around the affirmative action resolution, but martyrdom was not really the key. Should one credit the faculty proposers or the student activists of the era? Or mostly the general tenor of the tumultuous times? The civil rights movement was in motion, linking blacks and whites together in a common struggle. It was also the era of African decolonization, Kwame Nkrumah's *Négritude*, and the formation of the Black Panther party, all of which brought blacks together around our common experience.

I had balanced both movements during my time at Harvard College, but on Longwood Avenue, the critical mass of African American students had not arrived to foster what has become the Coleus Club. So, indeed, it was a need for "inclusion" of more persons of color—that is, to provide access and justice for an oppressed underclass—that motivated and justified the resolution. (The "diversity" rationale—that it helped others to attend classes with "others," an idea derived from James Baldwin's essays—had not yet joined the argument.)

In the historical discussion of affirmative action, let it not be forgotten that fewer than a dozen women entered HMS in 1966. Kate Millet's *Sexual Politics*, published in 1967, may have raised the consciousness to recognize another degree of narrowness in the selection of Harvard's student body.

In the late 1960s, good men and women were standing up for what was right in all institutions. As I remember it, the nine faculty sponsors had also taken personal and collective stands against the Vietnam War. We can be indebted to these men for making their stand in the faculty meeting in 1968. Indeed, there was a deep and broad ferment of student consciousness on the Quad that fed from the times (and fed into the times), and linked the evidence of exclusion and injustice with the opportunity for its redress. That is what we are acknowledging.



Martin Luther King, Jr. delivering his "I Have a Dream" speech on August 28, 1963

ing—I hope not with too much self-congratulation—in the 30th anniversary of an important milestone in the history of our alma mater.

NOEL W. SOLOMONS '70  
GUATEMALA CITY, GUATEMALA

### Faculty Members Respond

Joseph Albeck recalls correctly that a student petition carrying 278 signatures was presented to Dean Ebert in May 1968 and resulted in the appointment of a Harvard Medical School Commission on Relations with the Black Community in Boston. One of our group, Leon Eisenberg, as chair of that commission, reported its findings to the faculty in April 1969.

Dr. Albeck confuses that action, however, with a parallel but independent initiative undertaken by Jonathan Beckwith

and Edward Kravitz, who with seven other colleagues drafted a petition urging a commitment to admit 15 disadvantaged students each year. That petition was presented at the April 1968 Faculty Meeting and was voted on affirmatively at the May 1968 meeting (the same one at which the commission was established). Neither action "replaced" the other. The history of these events was described briefly in the Fall 1990 issue of the *Bulletin*.

We agree that we were stimulated, strengthened, and inspired by student activism. Noel Solomons is absolutely right in linking the general tenor of the times, the civil rights movement, the era of African decolonization, and other political forces to the action taken by the HMS faculty. Noel himself was invaluable in assisting us as we planned a strategy to secure faculty support.

To "credit" either the faculty sponsors or the student petition signers alone with the success of affirmative action at HMS overlooks the many individuals and forces at work. The Reverend King did not die "so that" minority students could matriculate at HMS. But his fight against racism and his assassination were pivotal

events in making white Americans recognize the enormity of the injustices inflicted on minorities. It created a climate in which even those faculty members who were dubious about the propriety of affirmative action felt it necessary to vote for the policy because our country seemed to be careening toward self-destruction.

Let us join Drs. Albeck and Solomons in remembering an important milestone in the history of HMS by situating it in the larger context of the times. Better yet, let us call for renewed efforts by students and faculty against the exclusion and injustice that still persist in our health care system and in our academic institutions.

LEON EISENBERG, MD  
JONATHAN BECKWITH, PHD  
EDWIN FURSHPAN, PHD  
EDWARD KRAVITZ, PHD  
BOSTON, MASSACHUSETTS



## Surgeon General's Warning

In your autumn issue, you quoted Surgeon General David Satcher as stating, "Only one third of physicians even ask their patients whether they smoke, let alone recommend that they stop." Five years ago, I told my wife and one of my sons that smoking might kill them. My 35-year-old son listened to me and never touched another cigarette. My wife just laughed and continued smoking. One year ago, she was diagnosed with cancer of the lung with metastasis. She never touched another cigarette. But it was too late, and she died.

CHARLES H. BAUER '53  
NEW YORK, NEW YORK

## Learning from the Masters

The wonderful and moving tribute that George Richardson '46 wrote about his brother Edward Peirson (E.P.) Richardson '43A in the Spring 1999 issue brought back many fond memories.

I first became interested in neurology during first-year neuroanatomy, when Raymond Adams, E.P., and others lectured to us, and we dissected formalin-treated sheep brains (scrapie-free, I hope!). In second-year neuropathology, the same cast of characters appeared to help us discriminate disease from normality in the neuropath lab, where the huge glass slides of brain sections—many "slices" from "brain cuttings" at Massachusetts General Hospital and Boston City Hospital—brought home the cellular life of the brain and spinal cord, and the effects of rabies, polio, encephalitis, and other diseases. These lectures captured my imagination and held it forever.

During third and fourth year, there were the clinics at MGH, headed by Vincent Perlo, who could turn my clinical findings on a new patient into a rare hereditary disease—Friedreich's ataxia—right before my wondering eyes. By the time of residency at MGH, we rotated on neurology, and watched C. Miller Fisher exhaustively examine a patient, as he did an intellectual CAT scan by piecing together the tidbits of abnormalities he found.

At the weekly "Brain Cutting" on Fridays, E.P. held sway, gravely listening to the clinical presentation before he ceremoniously and sacredly removed the dripping, uncut brain from the glass jar reeking of formaldehyde. Like a famous poultry chef, he took the razor-sharp, long, flat, stainless blade and cut through the brain with breadloaf-cutting precision, commenting like an archeologist on the findings as he passed through layer after layer. A reverent silence in the group of ten to fifteen faculty, neurology residents, rotating medical residents, and others sitting at the conference table allowed his quiet voice to enter each living brain in the room. It was a magical and mystical performance from a man who knew what he loved in the world of medicine, and spoke carefully measured words as he revealed the mysteries of the diseases of the brain to those in attendance.

At other times, I saw E.P. in the library, which was a haunt of mine when I finally reached faculty level. He was often there when I was there, but on many occasions he seemed to be either catching up on his sleep in the comfortable seats of the old Treadwell or thinking out some abstruse problem. Like so many others, I held E.P. in esteem, and learned as the years went by that he had a boyish enthusiasm hidden beneath his quiet ways, an enthusiasm that propelled him downstairs two steps at a time in the Baker Building stairwells, where I dodged him when I was on the way up.

I like to think that E.P.'s sailing adventures took him past many lighthouses. Like so many others in my medical career at MGH, E.P. was a beacon to me, and his light shines on.

NEWTON HYSLOP '61  
NEW ORLEANS, LOUISIANA

*The Bulletin welcomes letters to the editor. Please send letters by mail (Harvard Medical Alumni Bulletin, 25 Shattuck Street, Boston, Massachusetts 02115); fax (617-432-0013); or email (bulletin@hms.harvard.edu). Letters may be edited for length or clarity.*

## SAVE THE DATES

### Alumni Events to Mark the Millennium

The Harvard Medical Alumni Council invites you to keep up with the School's latest research, education, and clinical medicine by attending a special two-part seminar. "HMS at the Millennium: What's New and What's Happening In and Around the Quadrangle" will take place at HMS on October 20 from 3:00 to 5:30 p.m. and October 21 from 10:00 a.m. to 12:30 p.m. Featured speakers will include Deon Joseph B. Martin, Judah Folkman '57, Philip Leder '60, Peter Black '66, and Paula A. Johnson '84. CME Category 1 credit is available.

For more information, contact Tenley Albright '61 (617-247-8202; Tenley1003@aol.com), or visit [www.hms.harvard.edu/OnTheThreshold/index.html](http://www.hms.harvard.edu/OnTheThreshold/index.html)



### PARIS Left Bank

We offer rental of our spacious, well-appointed 17th century apartment home. The period decor includes all modern conveniences. The location is the finest in Paris, on the Rue de Varenne, 7th Arrondissement. Maid service and our *Guide to the Best of Paris* are included for free.



### ST. BARTS Caribbean

We offer rental of our wonderful home on the ideal tropical island. Our spacious property has a private pool and is carefully tended, perfect for honeymoons and relaxing vacations. Maid service and our *Guide to the Best of St. Barts* are included free of charge.

**(650) 327-2415**

PLEASE CALL FOR FURTHER PARTICULARS.  
IT WILL BE A PLEASURE TO ASSIST YOU.



**CLASS CLOWNS:** Above: Suzie Brown '02 assumes the identity of Cynthia McDermott, a lecturer in the anatomy course; below: Wilson Liao '02 impersonates Daniel Federman '53; and left: Jason Williams '02 portrays Judah Folkman '57 as a combination cruise doctor and lounge singer.

## The Second Year Show

**M**EMBERS OF THE CLASS OF 2002 sang, stomped, and step-danced their way through the second year show, "Perverse Transcriptase."

The show detailed the hunt for a retrovirus that had run amok. Students in the New Pathway tutorial group and the Division of Health Sciences and Technology embarked on a quest to save their classmates and professors from being transformed by the virus into "former incarnations and latent fantasies." While on that mission, the class lampooned life at the medical school through skits and parodies of popular songs.

To the tune of "One Day More," from the Broadway musical "Les Misérables," students sang: "One block more, eight more weeks of agony, then Christmas break and I'll be free."

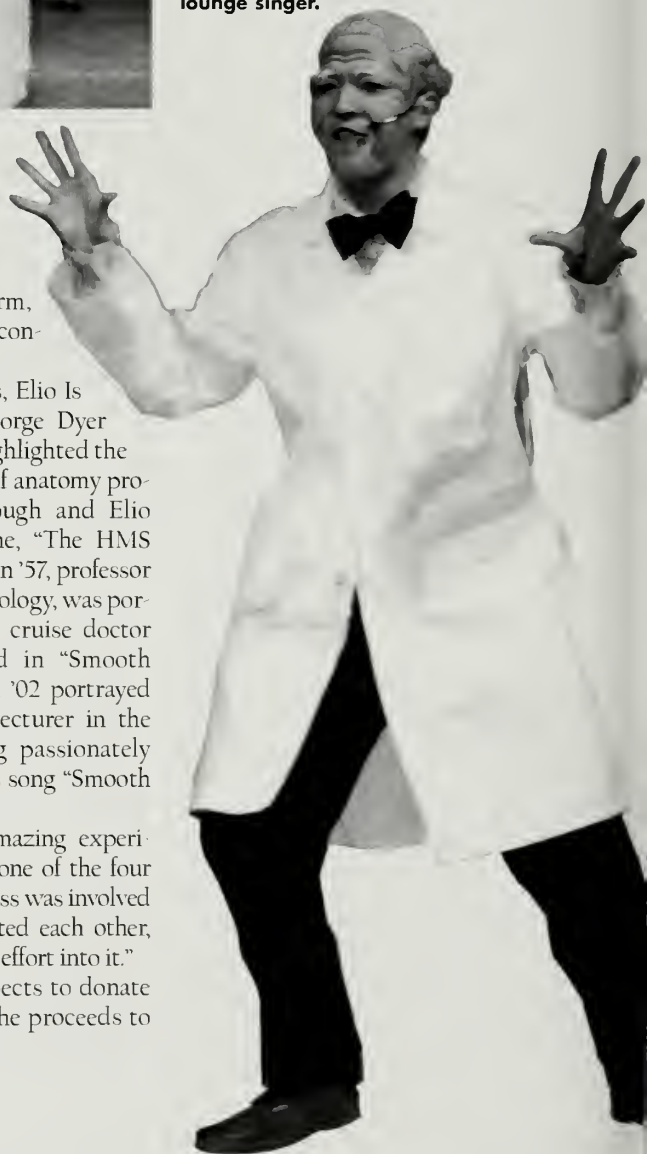
In "Gastrulate," sung to Kool and the Gang's "Celebrate," students portraying embryology lecturers Elizabeth Hay, Roslyn Orkin, and Betsey Sampson Williams belted out: "We've got our

endoderm and ectoderm, coming together to make conception firm."

For "Dan Is from Mars, Elio Is from Italy," students George Dyer '02 and Brady Case '02 highlighted the different teaching styles of anatomy professors Daniel Goodenough and Elio Raviola. In another scene, "The HMS Love Boat," Judah Folkman '57, professor of anatomy and cellular biology, was portrayed as a combination cruise doctor and lounge singer. And in "Smooth Obturator," Suzie Brown '02 portrayed Cynthia McDermott, a lecturer in the anatomy course, singing passionately about the pelvis to Sade's song "Smooth Operator."

"The show was an amazing experience," says Joyce Liu '02, one of the four producers. "Most of the class was involved in some way. We supported each other, and everyone put so much effort into it."

The Class of 2002 expects to donate more than \$5,000 from the proceeds to charity. ■





# Linking Biodiversity to Health

**E**RIC CHIVIAN '68, DIRECTOR of the Center for Health and the Global Environment at HMS, is championing biodiversity from a doctor's perspective. He has secured a commitment from the World Health Organization and the United Nations Environmental Program to launch an international scientific effort to document the impact of species loss and ecosystem disruption on human health.

The project—"Biodiversity: Its Importance to Human Health"—is to be implemented over a three-year period. It will culminate in the most comprehensive report yet about how biodiversity affects human health, including an assessment of policy options. Chivian's goal is to establish a sustainable framework so the report can be repeated every five years. Although interest in understanding the link between human health and global environmental change has been growing since the Earth Summit in Rio de Janeiro in 1992, no other attempts have been made to establish a regular, coordinated process to analyze this issue in the context of biodiversity loss.

"One of the greatest problems we face," Chivian says, "is that most people

still see themselves as separate from the environment, and therefore are not motivated enough to do what is necessary to preserve it."

Medical pharmaceuticals and research both rely heavily on other species, Chivian explains. Taxol, for example, one of the most promising medications to treat breast and ovarian cancer, is derived from the once-threatened Pacific yew tree. Overfishing continues to endanger some shark species that are valued for the insight they provide in the study of immune function.



**GUARDING THE FUTURE:** Eric Chivian '68 is spearheading an international effort to document the effect of biodiversity on health.

Furthermore, ecosystem disruption may lead to the emergence of some infectious diseases. Studies have linked the 1993 hantavirus outbreak in the southwestern United States, for example, to extreme weather that increased local populations of the virus-carrying deer mouse.

Although still in the planning stages, the project already has had an impact. The center has been invited to submit its findings to the Convention on Biological Diversity, the United Nations effort organized to set international policy for the protection and preservation of species and habitats around the world. ■

## Keeping the Tradition

For the 11th year in a row, HMS topped the *U.S. News and World Report* medical school rankings.

In the listings by specialty, HMS was rated first for internal medicine, women's health, geriatrics, and pediatrics. The School was listed second for AIDS and sixth for drug and alcohol abuse. HMS was also ranked second in the primary care category.

The results are based on four criteria: reputation (40 percent); research activity (30 percent); student selectivity (20 percent); and faculty resources (10 percent). The complete list can be found on the *U.S. News* website ([www.usnews.com](http://www.usnews.com)). ■

## THE SCHOTT LETTER

*The nation's most unique investment letter written & edited by John Schott, M.D. HMS '66*

**"The highly regarded Schott Letter helps investors cope with emotional hang-ups that make for mistakes in the stock market."**

*Forbes, Feb. 1996*

In 1986 Dr. Schott recommended the purchase of Berkshire Hathaway; will you be a reader when he finds the next Berkshire Hathaway?

**24% average returns for 12 years**

THE SCHOTT LETTER  
120 CENTRE STREET  
DOVER, MA 02050

\$110.00 for 12 issues  
MC VISA

**1 (800) 797-9678**

## decor international

141 newbury st., boston  
(617) 262-1529

Vegetable dyed folk rugs depicting Turkish village life.

orientals  
antique, tribal, Tibetan



## handwoven rugs

orientals • village rugs • Polish  
Romanian • Tunisian • Navajo  
American hand-hooked  
• tapestries • folk art  
Free Validated Parking

# PRESIDENT'S REPORT

**T**HE ALUMNI COUNCIL CONDUCTED an experiment by holding its first-ever out-of-town meeting. We invited all HMS alumni from the Washington/Baltimore area to join us for a town meeting at the National Library of Medicine in Bethesda on March 17 and 18. Our goals were to strengthen links with local alumni and to provide the talented alumni in the area with an opportunity to share their views with the Council and the HMS administration.

We began with a stimulating panel discussion led by Daniel Federman '53 and enlivened by interaction from the participants and alumni in attendance. The panelists were Jordan Cohen '60, president of the American Association of Medical Colleges; Steven Hyman '80, director of the National Institute of Mental Health; Kenneth Shine '61, president of the Institute of Medicine; and Barbara McNeil '66, chair of the Department of Health Care Policy at HMS—a distinguished group indeed.

Cohen presented us with a "good news/bad news" summary of the current state of medical education. He pointed out

that medical schools continue to attract high-quality applicants nationwide, but that issues of student debt and lack of diversity require attention. He also highlighted the current tensions between professionalism and commercialism in academic medical centers. The shift in teaching from the hospital to the ambulatory environment is a problem, Cohen added, as is the time pressure on teaching faculty.

Hyman provided an interesting perspective from the National Institute of Mental Health, which has been blessed by significant appropriation increases from Congress over the past few years. The institute, he said, now desperately needs to bring basic and clinical researchers together in translational research endeavors, which often require a large interdisciplinary research team for success.

McNeil pointed to the multidisciplinary nature of health policy research at Harvard, which, she said, is conducted with the input of experts in medicine, economics, statistics, sociology, and informatics. What, she asked, should HMS and its hospitals be doing to ensure quality of care?

Shine discussed the role of physicians in creating systems of care, emphasizing the need to train physicians in systems development, informatics, and outcome analyses—not areas in which physicians are generally schooled. He stressed that quality can be the lever by which physicians can regain their professionalism, and he predicted that third-party payers will increasingly value quality, not just lowered costs.

After a luncheon and remarks by Joseph Martin, dean of HMS, the Council continued an open meeting. Jules Dienstag, HMS faculty associate dean for admissions, spoke about the demographics of the incoming class. After a report by Tenley Albright '61, chair of the Alumni Fund, we toured the National Library of Medicine, a remarkable national resource that most of us had never visited.

The day proved most enjoyable and satisfied a yearning many of us feel to be part of a professional community. Our only regret was that more local alumni could not attend. If we take the Council on the road again, we will redouble our efforts to connect with local alumni for both their benefit and the good of HMS.

Bryan Arling '69 led a local committee of alumni in expressing appreciation to the Council for holding its meeting in the Washington area. "Here, as throughout the country, many doctors are experiencing angst, alienation, and frustration," Arling said. "A wonderful antidote to these feelings would be to attend one of these Council sessions. HMS obviously continues to strive for excellence and to seek ways to improve the way it trains its students, cares for its patients, and relates to its alumni. Watching our Council at work is exhilarating and inspirational."

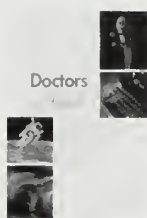
I hope to see you all in June to celebrate Alumni Week and the "Harvard Medicine at the Millennium" events. ■

*Sharon B. Murphy '69 is chief of the Division of Hematology/Oncology at Children's Memorial Hospital in Chicago.*



**ON THE ROAD:** Above, from left: Daniel Federman '53; Maria Alexander-Bridges '80; Gina Moreno-John '94; Sharon Murphy '69; Henry Chang '69; and Bryan Arling '69; right: Tenley Albright '61 and her husband, Jerry Blakeley





## The Search for Mental Health

*A History and Memoir of the World Federation for Mental Health, 1948–1997*, by Eugene B. Brody '44 (Lippincott, Williams & Wilkins, 1999)

This history follows the development of the World Federation for Mental Health from the end of World War II to its 50th anniversary in 1997. Brody illuminates the evolution of scientific understandings of health and illness, the federation's efforts to reduce the stigma of mental illness, and the unique circumstances that have kept a nationally, culturally, and professionally diverse group of people working together for the common ideal of positive mental health.

## Doctors Afield

Edited by Mary G. McCrea Curnen, Howard Spiro '47, and Deborah St. James (Yale University Press, 1999)

This book examines the lives of 27 physicians who have combined the art of healing with other pursuits, such as art, writing, music, and politics. The doctors profiled include a toymaker, a wine grower, an astronaut, and a cabaret singer. Their testimonies reveal how integrating medicine with other endeavors can provide physicians with inspiration and new energy to care for and relate to patients.

## Treating Emotional Disorder in Gay Men

by Martin Kantor '58 (Praeger, 1999)

Kantor's book offers guidance to help therapists create effective, gay-aware

treatment plans. He argues that gay men with psychological problems have fallen through the cracks thanks to opposite yet equally unsatisfactory approaches: one that views homosexuality as pathological and attempts to cure it, and another that attributes most of the problems of gay men to the negative effects of homophobia. In Kantor's view, both angles overlook the reality that gay men enter treatment with many of the same therapeutic needs as everyone else.

## Obsessive-Compulsive and Related Disorders in Adults

*A Comprehensive Clinical Guide*, by Lorrin M. Koran '68 (Cambridge University Press, 1999)

Intended as a practical guide for psychiatrists and other mental health professionals, this book presents in detail the diagnosis, clinical picture, and pharmacotherapeutic and psychotherapeutic treatments for obsessive-compulsive disorders. Treatment planning guidelines are given, and an extended chapter details the use of all medications that have been reported to be effective for these disorders, along with the management of drug interactions and side effects.

## Illness and Health in the Jewish Tradition

*Writings from the Bible to Today*, by David L. Freeman '69 and Judith Z. Abrams, Editors (The Jewish Publication Society, 1999)

In this anthology of Jewish reflections, writers offer their perspectives on health, illness, and recovery. The authors, who include doctors, scholars, rabbis,

and poets, address topics such as the role and duties of the physician, the role of prayer in healing, and the ethics of caregiving. They also examine key philosophical questions such as whether suffering and loss have larger meaning, and what the proper roles of secular and spiritual healers may be.

## Vascular and Interventional Radiology

by Karim Valji '82 (W.B. Saunders Co., 1999)

This introductory textbook, written for residents and fellows of radiology, is divided into three sections. The first emphasizes patient care before and after procedures. The second discusses the diagnosis and treatment in specific arterial and venous beds. The third presents non-vascular intervention. The book contains both traditional and state-of-the-art imaging, and includes a discussion of the newest innovations in the radiology field.

## Diva

by Rafael Campo '92 (Duke University Press, 1999)

In *Diva*, his third book of poetry, Campo revisits his favorite themes. Writing about his patients, his Cuban heritage, and his sexual identity, he blends pop culture and classicism, humor and pathos, beauty and gritty realism. From poems that form a satirical dialogue between the voices of AIDS and monogamy, to a series of prose poems on birthing, Campo's book illustrates how writing has helped sustain his sense of empathy in his medical practice.



## Digital Age: Evidence Points to a Genetic Expansion Behind Vertebrate Fingers and Toes

**T**HE EVOLUTIONARY TRANSITION from life in the sea to life on land might have been nudged by a genetic expansion, according to an article published in the February 2000 issue of *Development*. HMS researcher Susan Dymecki and her colleagues suggest that a gene previously expressed in the developing brain may also have come to be expressed in the tips of growing limbs, helping to bring about the development of fingers and toes in the first vertebrates.

"So the idea is you get expansion of gene expression—not expression of a new gene—just expansion to a new area," says Dymecki, HMS assistant professor of genetics. She and colleagues Scott Baur and Jia J. Mai have recently identified both the structure of a gene and a genetic switch that could have brought about such an expansion.

Until recently, the gene, which codes for a receptor found in the brains and skeletons of all vertebrates living today, was thought to be controlled by a single switch, or promoter. If that were true, a defect in the promoter should affect expression in the brain as well as the skeleton. But the researchers found that while mutant mice carrying such a defect lacked fingers and toes, their brains appeared, for the most part, normal.

### Two's Company

On closer inspection, the researchers found that there was not one but two promoters, one controlling gene expression in the brain, the other, which carried the mutation, controlling expression in the limbs. The defective promoter was farthest away from the gene. "This is the first time anyone has seen this distal promoter," Dymecki says.

She and Baur, a graduate student, suggest that this distant promoter may have evolved more recently, perhaps as a result of a duplication of the one lying closer to

the gene. Once formed, the new promoter may have accumulated mutations that enabled it to interact with transcription factors found in developing limb cells. As a consequence, the receptor previously expressed in the brain would have come to be expressed in the limb buds.

"This is speculation at this point—we could be wrong," Dymecki says. "But it could also lead to some exciting science." Baur is currently comparing the two promoters to see if he can find signs of a duplication. If so, it would suggest that the origin of life on land could have entailed not just the invention of new genes, but also putting old ones to new uses. It is a process nature has used many times before, Dymecki says.

The Hox genes, which were first found to regulate body shape in flies and are now known to regulate body and limb development in vertebrates, are thought to have produced their wide variety of evolutionary effects by being expressed to different extents at different times and places in different animals. Similarly, the newly discovered promoter may have played a role in bringing about the diversity of vertebrate digits—from the frog's grasping toes to the stubbier toes of a human—by the timing and location of receptor gene expression.

"These are things we're still fleshing out," Dymecki says. "It's been a real whirlwind just to get this paper out." In fact, their paper appeared in *Development* along



**A GENETIC SWITCH:** Comparisons of the embryos of normal and mutant mice by Susan Dymecki and her colleagues are yielding clues to limb development and evolution.

PHOTO: GRAHAM RAMSAY



with a paper by a group at UCLA. The California researchers knocked out the receptor gene in a strain of mice. Intriguingly, the knockout mice exhibited the same phenotype as the HMS mutants. They lacked digits but their brains appeared normal. One possible explanation for the masking of effects in the brain is that the receptor may play such an important role there that nature has provided a genetic backup to make sure that its job gets done.

### Accidental Scientist

If it hadn't been for a twist of nature, Dymecki and her colleagues might never have identified the second promoter. Her whole excursion into skeletal development "was definitely serendipity," she says. In the course of studying brain development—her primary interest—Dymecki had generated a series of transgenic mice, each with a piece of DNA wedged into a different part of the genome. When she and her colleagues tried ear tagging one strain, they discovered that the mice were unable to grab the tabletop.

It turned out the mice had failed to develop digits. Suspecting that the piece of DNA had inserted itself into the middle of a gene for skeletal development, the researchers homed in on the gene, which produces IB bone morphogenetic protein receptor (BMPRIIB). The protein was known to play a role in skeletal development, specifically the laying down of the cartilaginous blueprint that eventually develops into the bony skeleton. But no one had actually mapped out the structure of the gene (*Bmpr1B*)—that is, how exactly it is broken up into functional units, or exons.

After identifying the structure of *Bmpr1B*, Baur was able to determine that the chunk of DNA had become integrated, essentially knocking out what appeared to be the promoter. The lack of any apparent defect in the brain of the mutant—at the time they did not know that even knockouts show no brain defects—led them to look for a second regulatory element.

Dymecki and her colleagues plan to use the transgenic system to see exactly how the limb-region promoter turns on *Bmpr1B* during mouse development—in which cells and at what times. Comparing *Bmpr1B* regulation in mice and other animals could provide a preliminary step toward understanding how the extraordinary array of land-dwelling adaptations have evolved in different species.

"We want to understand what regulatory elements are involved and what the evolutionary implications of those elements are in terms of species-to-species variation in digit formation," Dymecki says. "It does make me chuckle that it all came out of a simple transgenic insertion." ■

Misia Landau is the senior science writer for Focus.



Many bones, including the digits of the hand and foot, develop from a cartilaginous blueprint laid down in early development (top panels). During development, cells destined to become cartilage aggregate loosely, then condense and proliferate to form the blueprint for the adult skeleton. In mutant mice carrying the defective *Bmpr1B* promoter, the cells destined to form the digital cartilage neither condensed nor proliferated normally (top left). Consequently, adult mutant mice failed to form phalanges (bottom left). Susan Dymecki and Scott Baur suggest that BMPRIIB, interacting with the protein GDF5, may send signals to genes involved in the condensation and formation of digital cartilage. In addition, BMPRIIB and GDF5 may act independently of each other to promote the segmentation of cartilage into individual phalanges.

Forensic detectives are bringing  
new scientific tools into the courtroom to  
unlock decades-old secrets

# A SINGLE STRAND

MARY THERESA BURHOE WAS 14 WHEN SHE WAS stabbed more than 100 times. Her body was discovered days later in the tall grass of a playground near her Boston home, her chest so mutilated that authorities at first assumed a shotgun blast had killed her. For nearly 20 years, the brutal crime remained unsolved. But now, cutting-edge technology has helped police restart the investigation and file charges.

“Not only are closed cases being reopened because of scientific advances, but cold cases are

*by* PHYLLIS L. FAGELL





T

# he telling detail may come from a single strand of hair.

being reinvestigated," says Frederick R. Bieber, associate professor of pathology at HMS. The prosecution has consulted Bieber about DNA evidence related to Mary Theresa's death.

Shortly before the murder, Patrick Durham, the chief suspect, allegedly put a knife to the girl's throat and threatened to kill her. But without current DNA technology, prosecutors could not obtain a murder indictment. Now, decades later, a bloody bandage taken at the time of the crime from Durham has taken on new importance. Using the latest technologies, investigators compared the DNA found on the bandage with evidence from the crime scene. According to David Meier, chief of homicide in the Suffolk County District Attorney's office, the DNA evidence "conclusively links" Durham to the slaying. "As a result of various evidence presented to a grand jury over the last several months," he says, the defendant was indicted in January for first degree murder.

"I often think about the overwhelming number of unsolved cases that could benefit from the scrutiny of forensic scientists using the latest techniques," says Bieber, who also is a member of the DNA Advisory Board of the Federal Bureau of Investigation and of the Royal Canadian Mounted Police. "There are so many cases in which detectives have suspected a certain individual, but just haven't had adequate tools and technology to evaluate trace physical evidence."

DNA evidence can also have near-irrefutable exculpatory power. The chances of a coincidental match are "vanishingly small," says David Page '82, chair of the Whitehead Task Force on Genetic Testing and Public Policy. Through the task force, Page has been bringing news about genetic discoveries to diverse audiences, including judges. "The impact of the human genetics revolution will be tremendous," he says. "The well-known forensics applications of genetic testing are only the sim-

plest part of the revolution that judges will have to grapple with in the future." Broader discussions will revolve around questions of public policy, he explains, because the technology itself has become so sophisticated and reliable.

These days, in fact, even trace amounts of genetic material may provide investigators with answers about a suspect's involvement in a crime. The telling detail may come from a single strand of hair clutched in the hand of a murdered elderly woman, or from epithelial cells found under a rape victim's fingernails.

And, as tests have improved, these microscopic bits of evidence are taking center stage in trials. When DNA analysis provides a particularly dramatic clue, Bieber says, "a pin drop can be heard in the courtroom."

He recalls one high-profile case, which involved the 1994 shooting death of Massachusetts State Police Trooper Mark Charbonnier. Charbonnier had pulled over a van being driven by the defendant, David Clark. The defense raised the theory that Clark might have picked up hitchhikers who had actually shot the officer.

"The members of the jury were clearly riveted by the testimony of every expert witness," Bieber says. Most dramatically, the DNA analysis of the crime scene evidence supported the prosecution's contention that only two people, the victim and the defendant, were at the crime scene, and the jury convicted Clark.

## A Long History

Forensic medicine received its first major boost more than 100 years ago. During the 1880s, the same decade that London novelist and physician Sir Arthur Conan Doyle created the world's most famous detective, Sherlock Holmes, Scottish physician Henry Faulds published a letter in *Nature* that triggered modern fingerprint analysis.

The individuality of human fingerprints had long been recognized, but the debate in *Nature* led an English scientist, Sir Francis Galton, to study them seriously. Another major breakthrough came in the early 1900s, when an Austrian physician, Karl Landsteiner, standardized the blood grouping system, and police and prosecutors realized that blood testing could help them solve crimes.

"In the past," says Bieber, "biological evidence was characterized using either serologic testing to determine blood types, or isoelectric focusing to subtype certain protein components of blood. There's nothing wrong with this kind of testing, but it's much less discriminating, and it has less exculpatory power."

Other medical techniques also have been used in the past to solve crimes, Bieber points out, including microscopic hair comparison testing and morphometric skeletal analysis, a technique that is still used today to provide important clues about a victim's age, sex, height, and racial characteristics.

## An Ocean Apart

Despite these advances, it is the last 15 years that have truly revolutionized courtroom science. Once considered highly esoteric, technical phrases such as "restriction fragment length polymorphisms" (RFLP) and "polymerase chain reaction" (PCR) have now entered the mainstream media.

In the mid-1980s, huge scientific leaps in forensic medicine were made on both sides of the Atlantic. In England, Alec Jeffreys, a young geneticist at the University of Leicester, constructed a set of radioactive probes that allowed RFLP methods to reveal what he referred to as a "genetic fingerprint." RFLP methods rely on inherited differences in the lengths of DNA fragments produced after cleavage of DNA with restriction enzymes. Jeffreys marked





the different-length segments with the probes and exposed them on x-ray film, where they formed a pattern of black bands—the “fingerprint.” If the DNA profiles produced from two different biological samples matched, he conjectured, they probably came from the same person.

The dramatic impact of Jeffreys’s work became evident in 1986, when it excluded a 17-year-old boy in the nearby village of Narborough who had confessed to the sexual assault and murder of a teenage girl. The boy was the first accused murderer to be set free as the result of a DNA profile. To catch the true killer, investigators collected blood from several hundred male members of the community, a process the police referred to as a “blooding.”

“Today, with a complete analysis of multiple loci,” Bieber says, “the probability of finding the same profile in two unrelated individuals is so remote—in the billions, trillions, quadrillions, or quintillions—that it has essentially

become a source identifier.” Bieber says he prefers to use the term “DNA profiling” rather than “DNA fingerprinting,” though. “Fingerprinting implies that any type of DNA typing is a unique identifier,” he says, “but there are unusual exceptions, such as identical twins, who would have identical nuclear DNA profiles. Furthermore, those people who have received a bone marrow transplant would have different DNA profiles—their own constitutional DNA, along with the profile of the marrow donor. This could create confusion in a forensic investigation, depending on the tissue source of the biological evidence that was left at a scene.”

#### Coming Out in the Wash

While Jeffreys was using RFLP techniques, Kary Mullis, a young biochemist working in California, was close to another breakthrough. He was trying to fix glitches in a prenatal diagnostic test that was not sensitive

enough to consistently detect the genetic mutation that causes sickle-cell anemia. To solve the problem, he developed a method of amplifying trace amounts of DNA into large quantities. The technique, called PCR, involves repeatedly separating paired DNA strands and using each strand as a template for a new DNA segment. In the late 1980s, two other biochemists in California, Henry Ehrlich and Edward Blake, realized that PCR could be used to investigate crimes.

The RFLP and PCR systems complement one another. Jeffreys’s approach requires larger amounts of genetic material than Mullis’s, but its end product is highly discriminatory. Meanwhile, the PCR technique can be effective in allowing DNA profiling even with trace or degraded biological material.

Bieber recalls his first criminal case, one that he says would have benefited from PCR amplification. “There was a rape in a neighborhood on the South Shore of Massachusetts,” he says,

adding that after the sexual assault, the man had made a violent exit, driving the woman's car through her closed garage door. "In the initial analysis, there were no sperm cells found in the rapist's semen obtained from the victim. Yet, the age estimate of the attacker was late teens to early twenties, so a vasectomy didn't make sense.

"A couple of months later, a rape attempt was made in the same neighborhood. Just as in the first case, the man made a violent exit, this time crashing through a glass window," Bieber says. "All we had was an unconscious man at Massachusetts General Hospital, the 'violent exit' link between the two cases, and some incriminating statements the suspect later made to police investigators."

At Bieber's suggestion, the prosecution obtained a court order to allow him to perform a chromosomal analysis of the suspect in his laboratory at Brigham and Women's Hospital. The test revealed that the suspect had a 47, XXY karyotype, which invariably leaves males with little or no spermatozoa in their ejaculate. "While circumstantial, this cytogenetic test result was directly relevant and therefore probative, considering that this defendant was quickly convicted of all charges," Bieber says. "DNA testing at the time wasn't possible because there were no sperm in the seminal fluid evidence. Today, PCR would undoubtedly be used in such cases because of its ability to amplify DNA in white blood cells and other cellular debris found in semen."

By 1988, criminal cases involving genetic profiling were being prosecuted across the United States. And that year, DNA technology was used for the first time to exonerate a wrongfully convicted man, Gary Dotson of Chicago, who had been jailed for more than ten years on rape charges.

More recently, the technique was used to clear at least one suspect and

convict another in the murder of Paul McLaughlin, a prosecutor in the Massachusetts Attorney General's Office. DNA analysis provided investigators with evidence that incriminated Jeffrey Bly, now serving life in prison for the murder. "What is amazing about this case," Bieber says, "is that DNA analysis of a hooded sweatshirt found along rail tracks near the crime scene revealed McLaughlin's blood on the outside of the shirt, and Bly's DNA profile on the wear area of the collar."

And last year, Norman Gahn, an assistant district attorney in the Milwaukee County Sexual Assault Unit, issued one of the first "John Doe warrants," for the arrest of an "unknown male" whose DNA profile matches DNA evidence collected from three rape scenes. "The victims were raped in 1993," Gahn says. "I issued the warrant in September 1999, days before the statute of limitations would have expired, because once the statute expires, there's not much you can do when you catch the person."

### Connecting the Dots

Dramatic outcomes frequently result when DNA testing is involved, and its exculpatory power has turned many lawyers into crusaders for justice. "DNA evidence has this unique property where you can go back and look at evidence that is 10, 20, 30 years old," says Barry Scheck, co-director of the pro bono Innocence Project at the Benjamin N. Cardozo School of Law in New York City, which seeks to use DNA testing to exclude those who may have been wrongfully convicted through circumstantial evidence. "You can subsequently speak the truth in a trial where the defendant kept claiming his innocence, but was nonetheless sentenced to life in prison or death row." In addition, Scheck adds, "every time you exonerate the innocent, it

gives you a better chance to catch the real guilty party before he goes out and commits other crimes. So the public safety argument here is critical; it's win-win for law enforcement."

When Scheck founded the Innocence Project, he says, he only took cases in which a DNA test could prove innocence. "In they came, inmate after inmate, family after family, and exonerations began to pile up. It spread across





go back and look at evidence that is 10, 20, 30 years old.”

pens to be biological evidence,” Scheck says. “But what about all those people who go to trial on the same type of eyewitness identification, jailhouse snitch testimony, junk forensic science, prosecutorial misconduct, police misconduct, bad lawyers—what about all those people in situations that lead to wrongful convictions where there is no biological evidence?” DNA testing, he says, is highlighting fundamental problems in the legal system.

Enthusiasm about the technology has given rise to other concerns as well, such as the difficulties of implementing the technology routinely and properly. “Unfortunately, the capacity of the DNA labs is terrible in this country,” Scheck says. “We have a lot of evidence from old, unsolved crimes being thrown out without doing DNA typing. We are so backlogged.”

“From the standpoint of applying the technology in the criminal justice system,” Asplen adds, “we have more than 180,000 no-suspect rape kits across the country that have never been DNA tested or entered into any of the convicted-offender databases. Our technology surpasses what we are currently capable of implementing.”

Convicted offender databases, which individual states use to store DNA profiles collected from certain categories of convicted rapists and killers, are being increasingly used by investigators. The FBI Laboratory began employing its Combined DNA Index System (CODIS) in 1997. The system established common standards for forensic testing so that states could pool their information. Asplen predicts that every state will be on-line and able to share data with other jurisdictions within two to three years.

As soon as CODIS was activated, it was used to place an assailant at a crime scene. In August 1989, in Rock County, Wisconsin, a 12-year-old girl was riding her bicycle when she was abducted by a man in his thirties. He raped and beat

her and left her for dead. Remarkably, she survived, but the traumatized girl was unable to identify her assailant. Then, in December 1997, as databases in states across the country were first able to compare DNA profiles, a match was made almost immediately. A DNA profile taken from the Wisconsin rape was identical to the one obtained from Roy Foster, who had been convicted of several sexual assaults in Illinois.

“DNA fingerprinting can lead to ‘cold matches,’ or situations in which DNA profiling identifies someone who wasn’t even a suspect,” says Page, the Whitehead Task Force member. “This is already happening in some states and, especially, in Great Britain, where they’ve had a fairly aggressive DNA fingerprinting program for many years.”

“Many criminals are recidivistic,” Bieber says. “That’s the rationale for these offender databanks—to link serial and unsolved cases to known offenders. To date, CODIS has provided important investigatory leads in more than 600 cases in the United States.”

In the future, adds Page, “it will be interesting to see whether DNA fingerprinting everyone in the population becomes the norm.” But if a universal system were to be installed, he predicts, “one can foresee a debate between libertarians who will argue that this is a terrible invasion of privacy, and those who will argue that such a measure would improve the safety of everyone.” He points out that such a system already exists. “By far, the largest genetic databases in this country are the ones involving blood samples that every newborn baby in most states unknowingly donates for medical, not forensic, purposes.”

Page offers historical perspective to underscore the significance of policy questions about how to bank and access DNA information. Back in the 1920s, he notes, “a U.S. Supreme Court decision authored by Oliver Wendell Holmes III essentially opened the door for state-

the country to the point where there have now been 64 exonerations in the United States and six in Canada.”

Assistant U.S. Attorney Christopher Asplen, executive director of the National Commission on the Future of DNA Evidence, points to another telling statistic. “In 20 to 25 percent of cases, DNA profiling excludes the initial suspect.”

“We’re proving that there is a definite class of cases where there just so hap-

mandated sterilization for eugenics purposes," he says. "All we have to do is look at that example to see the role that judges and courtrooms will play in structuring how the genetics revolution is applied to society. It will encompass a lot more than DNA fingerprinting."

### By a Hair

In the meantime, both RFLP and PCR techniques, which look at variations in either the size of DNA fragments or their sequence, have consistently improved. In the last three to five years, says Bieber, "forensic geneticists across the United States and Europe have standardized on STR typing—profiling DNA by examining heritable differences known as short tandem repeats. These length polymorphisms consist of variable numbers of adjacent copies of identical four-base-pair DNA repeats."

In addition to STR typing, other methods have contributed to an increased reliance on DNA profiles, Bieber says. PCR can now "amplify DNA from trace evidence including the saliva left on ski masks during robberies, the 'wear areas' on the collars of shirts, and epithelial cells left on a victim's neck by the hands of a strangler," he says.

This type of testing appears to have played an exculpatory role in one still-unsolved case, in which a woman was found beaten and dead in a wooded area south of Boston. A suspect was arrested after bite-mark experts examined the patterns left by the perpetrator's teeth. This type of examination, known as forensic odontology, is a growing area, but experts in this case could not reach a consensus on the source. Ultimately, profiling of DNA swabbed from the wounds did not match the suspect's DNA profile.

Investigators are benefiting from another scientific advance as well: the typing of mitochondrial DNA, which is "found in the non-nuclear component of cells," Bieber says. "It has tremendous utility for typing hair shafts, bone, and fingernails that don't contain adequate nuclear DNA. Evidence from mitochondrial DNA sequencing has now been used in three homicide cases in the United States, and all the convictions have been upheld on appeal."

Mitochondrial DNA evidence was introduced for the first time in a U.S. courtroom in Tennessee in 1996. Before

The technology, however, is a double-edged sword, says Richard Lewontin, a professor at Harvard University's Museum of Comparative Zoology, who has testified in court about DNA evidence. "It gives the state a powerful scientific legitimacy even if the lab work was sloppy," he says. "When you have the suspect's blood in a large tube, and a smidgen of blood from the crime scene, if you're not careful, you can contaminate the crime scene with the suspect's blood."

That's the real risk, Page says. "People take great comfort in talking about DNA matches as a statistical question, but the problem is that the one thing you can't describe adequately through statistics is the real danger—bookkeeping errors or contamination."

"The technology makes convictions all the more credible because they've been done in the name of science," Lewontin says, noting that incorrect matches also can be made because technicians simply "don't look at enough genetic markers." There is an upside, he adds. "The technology can actually be used to exculpate people, but it takes time and money."

### It's in the Blood

In addition to looking to suspects' DNA for answers, investigators sometimes find surprising information in the genetic makeup of some of society's youngest victims.

"Physicians and other caregivers are duty-bound to report suspicious signs of child abuse or neglect," Bieber says. But, he adds, "collectively, we need to be more aware of genetic conditions that can masquerade as trauma or abuse. Examples include heritable chondrodysplasias, which can present with bone fractures and may be mistaken for traumatic injuries."



the testing was performed, only circumstantial evidence pointed to 27-year-old Paul Ware as the suspect in the rape and murder of a four-year-old girl. The child's blood was not found on the suspect, and his semen was not found on her body. Yet, the mitochondrial DNA found in a single strand of red hair collected from the girl during her autopsy—and in several red hairs collected from the crime scene—matched the defendant's DNA profile.



# If there still is no identification, we look at dental charts.”

A case in St. Louis highlights another example of genetic conditions mimicking child abuse. Methylmalonic acidemia is a rare autosomal recessive disorder that can be misinterpreted as ethylene glycol poisoning. In this case, a woman was actually convicted of murder when her first child died and two laboratories incorrectly reported finding ethylene glycol—a component of automotive antifreeze—in the child’s serum and urine.

“Medical geneticists watching the news recognized the features of methylmalonic acidemia,” Bieber says. “And when the woman’s second child was born in prison, that baby presented with the same symptom complex. Under court order, appropriate testing revealed that both infants suffered from the same genetic condition. Her conviction was eventually vacated, and the second child was treated.”

Yet what if scientists could identify something more sinister in the genes—variants that predispose individuals to violent, potentially criminal behavior? To what extent should that information be admissible in court? The question, says Page, is not merely hypothetical.

“A monoamine oxidase deficiency was discovered in a family in Holland that was unambiguously correlated with violent behavior,” he explains. “Out of that revelation have come several attempts to base criminal defenses on the possibility that the person charged carries a similar gene. In criminal proceedings, we will see how notions of culpability change as the debate over genes and behavior rolls forward.”

## Tales from the Crypt

Despite advances in DNA testing and its applications, medical examiners use many of the same techniques today as they did decades ago, says Leonard Atkins, associate professor of pathology at HMS.

“I’ve worked in this field for 43 years and have performed more than 4,000 autopsies,” Atkins says. “To identify the body, I do pretty much the same things today that I did back in 1957. I look for the usual statistics, such as height and weight. On every homicide, we get police to fingerprint the body. If there still is no identification, we look at dental charts.”

To determine the cause of the victim’s death, and to glean any other relevant information, Atkins looks for specific clues while performing autopsies. Details—such as the direction a bullet entered the body, the pattern imprinted

on a blunt injury wound, the nature of chemical burns around the mouth, fingernail marks or grooves on the neck, or the size and appearance of a stab wound—can become crucial points in court. “Murder cases are different from those encountered in a hospital practice, where the person has been fully worked up,” Atkins says. “Sometimes all we have is a body, with no other information.”

He recalls one case in which his sleuthing helped solve a murder. In 1971, a badly decomposed human torso with a hatchet embedded in its chest was discovered in an inlet of Boston Harbor. Atkins determined that a gunshot



# Y

ou can trace evidence at a scene with just the saliva

wound was the cause of death. But identifying the victim would prove to be much more difficult. Because the victim's head had been severed, Atkins couldn't rely on dental records, and because the hands were missing, he couldn't rely on fingerprints. With little else to go on, he had x-ray films made of the torso.

At the time the body was found, the Boston Police Department was investigating the disappearance of John James Rooney, a white male within the age span Atkins had attributed to the torso. Atkins knew that without Rooney's body, it would be difficult for prosecutors to try the case.

"I thought the victim might have been seen at Boston City Hospital since he was from Dorchester," Atkins recalls. "Sure enough, he had been

treated there twice in the last six months for back and shoulder problems." Atkins requested that the antemortem and postmortem films of the chest and spine be compared, and a radiologist determined that the victim was indeed Rooney. "Each individual has a pattern to his or her bones that is unique," Atkins explains.

The defendants were convicted, largely on the basis of the medical evidence. Atkins adds that the case was the first criminal trial in which a corpse was identified on the basis of normal bone patterns seen on x-ray films.

Although he "does the same amount of work" that he has always done, Atkins notes that advances in DNA testing mean that "we have more precision in terms of identifying someone who was at a particular place at a cer-

tain time—it overwhelms every other advance. You can trace evidence at a scene with just the saliva on a cigarette."

In late January, in fact, a former Boston man was sentenced to life in prison for raping and murdering a 19-year-old college student whom he met on the subway. The crucial evidence? Cigarettes the suspect had left behind after police questioned him. The saliva left on the butts was tested for DNA, evidence that was ultimately key to his conviction. At the time of the interrogation, the suspect, Lee Perkins, was serving a prison sentence on a prior rape conviction.

## Cracking Cases

In addition to DNA profiling, advances in nuclear medicine and toxicology testing are helping to solve crimes. "In the 1950s," says Charles Petty '50, professor of forensic sciences and pathology at the University of Texas Southwestern Medical Center at Dallas, "there wasn't much more in forensic toxicology than test-tube science. We didn't have delicate, sophisticated instruments. We didn't have nuclear magnetic resonance analyses to detect heavy metals such as arsenic, or high-pressure liquid chromatography to test for foreign substances."

One case in particular, he says, highlights how much has changed in the last 50 years. In 1956, Petty took a short-term job covering for a pathologist in small-town Louisiana. While he was there, a physician stopped by to relate a perplexing case—his patient had experienced sudden onset of diarrhea and vomiting and felt peculiar.

"I suspected arsenic poisoning," Petty says, "and I suggested we test his urine. But there were no forensic or crime labs in town, so I did an old-fashioned test. I took a penny, cleaned it with nitric acid to make it shiny, dropped it in the patient's urine, and





on a cigarette.”

brought it to a boil. The penny turned black from the arsenic deposit. We found out that the man, who later died, was suicidal and had eaten the arsenic deliberately.

“But that was arsenic poisoning then. In this day and age, we can make that diagnosis in all sorts of ways. Now we can detect minute quantities of drugs in a person’s system, and we can get an idea of how long it has been since the person ingested the drugs.”

### In the Field

The future will hold even more advances, Bieber says. In four to six years, he estimates, “microchip array systems, which allow many genetic tests to be done in parallel on a small surface, may one day enable limited DNA testing in the field. We won’t need to send the samples to the lab; I predict that we’ll be able to perform some initial screening using portable implementation.”

“The ability to test at the scene is coming along so rapidly,” Petty says. “It will have a tremendous impact.” Such testing would have implications far beyond crime solving—it could be employed, for example, to rapidly identify victims of mass disasters, plane crashes, or war. The military is already collecting DNA on its soldiers as modern-day dog tags.

“We need to improve the laboratory infrastructure so that police can really use DNA evidence as an investigative tool, rather than arresting suspects based on other evidence, and just using the DNA as a means to prove their guilt in court,” Asplen says. “That’s the real future of the technology—being able to do more with less.”

### Weighing Evidence

Much of what forensics attempts to do is identify pieces of evidence, Bieber



says. “What is it? Where is it? Where did it come from?”

As investigators struggle with these types of questions, scientific advances will continue to add to their arsenal. In the meantime, expert witnesses will do their best to help judges and juries weigh the relative importance of each piece of medical evidence. It’s a task that can be both technically and emotionally demanding, and sometimes frustrating.

Page decided never to testify again after serving as an expert witness in a murder trial in the late 1980s. “It’s as if you’re a horse with blinders and a very tight rein,” he says. “I felt very much like a pawn on the witness stand. Expert witnesses are led phrase by phrase by attorneys. They’re rarely given an opportunity to expound on what they believe to be the most relevant aspects of a particular question.” The defendant in that case was exonerated.

When Bieber testifies, he feels “an overwhelming sense of responsibility to be a fair and impartial expert witness. You know jurors may be hanging onto your every word. Every single case I’ve worked on is full of drama, because lives have been lost.” Bieber compares courtroom testimony to teaching a small seminar. “The role of the expert witness is to remain an impartial educator to a class of 12,” he says. “And attorneys have related to me that of all the testimony jurors hear, they are particularly interested in DNA evidence.”

The significance of recent advances in forensic medicine is certainly not lost on the families of victims like Mary Theresa Burhoe. “I thought I never would see the day,” the girl’s stepfather, Richard Vardenski, told the *Boston Globe* when a suspect was arrested nearly 20 years after the crime. “It feels great.” ■

*Phyllis L. Fagell is associate editor of the Harvard Medical Alumni Bulletin.*

# BODY *of* EVIDENCE

A physician applies his knowledge of the dead to help the living

FROM ALASKA TO THE CAYMAN ISLANDS, JOHN MARRACCINI '78 has enlightened courts, legislatures, and law enforcement agencies with his knowledge of topics ranging from gunshot injuries to poisonings. The areas of expertise detailed in his curriculum vitae, in fact, provide harrowing testimony to the fragility of the human body and psyche: blood spatter caused by gunshot wounds; sharp-edged weapon injury pattern and interpretation; electrocution injuries; drug intoxication and human behavior. The list spans two pages, documenting the various ways in which human beings can meet with—and inflict—death.

*by* BEVERLY BALLARO



OFFICE OF THE MEDICAL EXAMINER

Case No.

5341-96

Sex

M

Age

29

Race

W

Name

Unknown

Tagged at

Central and Mockingbird

Tagged by

T.C.

Time in

2:47 a.m.

F14

Once Marraccini became a father, he found it increasingly autopsy seems like your own baby, and you vicariously feel



Deputy Chief Medical Examiner John Marraccini demonstrates on prosecutor John Moyle how broom handle could have caused neck injury found on Mario Abraham's body.

## Judge: Inmate's death 'crime'

What drew Marraccini to the field of forensic pathology, however, was not a preoccupation with the macabre, but a desire to help families and society by pursuing with vigor and intelligence the cause of death. In his 14 years of work in the medical examiner's office of Palm Beach County, Florida, where he was eventually appointed chief medical examiner, Marraccini brought numerous mysterious cases to closure.

"Yet the pain of loss remains for the families and survivors," Marraccini says. "Helping to bring a murderer to justice provides little solace—the touch and voice of a husband or father cannot be replaced. The void created by the death of a child is never filled by the passage of time. Guilt and sorrow are the legacy, and for all we do to document death, medical examiners cannot palliate these human aches."

Forensic science flourished at HMS in the forties and fifties, but Harvard's interest gradually waned, perhaps, Marraccini speculates, because the field was widely perceived as not being

**SWEPT AWAY:**  
During a public inquest, Marraccini demonstrates how a broom handle could have inflicted a lethal neck injury on the murder victim.

conducive to cutting-edge technology. After all, the basic tools of his trade have been around for quite some time; the use of the autopsy goes back at least 600 years, and microscopic slide examinations around 120 years. Although DNA analysis is a powerful and thoroughly modern tool, it tends to be conducted not by medical examiners' offices, but at associated crime laboratories.

For these reasons, Marraccini says, some continue to view forensics as a backward science belonging to the descriptive phase of medicine. Yet he and his colleagues have continually refined their profession, thanks to a judicial environment that now routinely subjects their opinions to tough scrutiny. Marraccini welcomes this change, which has made forensic science a more rigorous discipline. "When you can anticipate and answer every conceivable question—and enjoy the process—you know you've come into your own as an expert," he says.

Over the years, Marraccini has delved into many fascinating cases of

sudden death, including those caused by virtually every variation of natural disease: obscure vascular malformations, myocardial disease, bands of Ladd, Addisonian crises, allergic phenomena, strange septicemia, and the earliest cases of AIDS. He has also analyzed hundreds of accidental deaths, acquiring along the way a profound understanding of which vulnerable points of the human body characteristically give way to shearing and crushing forces.

Yet some of Marraccini's most striking insights have come not in the area of anatomy but in the realm of human character, which, he wryly notes, "has not changed much, and yet the vices come and go." He has autopsied more than one patient who died in a plastic surgery misadventure in the never-ending quest for beauty, and he has witnessed overdoses shift from heroin to cocaine to ecstasy to rohypnol and back again. He has seen intoxications decline, drive-by shooters replace cocaine cowboys, and the homicide body count drop to half of what it was in the early eighties.

### Out of the Ashes

Throughout the parade of mayhem, Marraccini has held fast to the preventive knowledge and ethical advances that have emerged from his work. When airbags came into vogue and began to create their own distinctive injuries, for example, it fell to Marraccini and others in his field to bring to light the unforeseen hazards inadvertently built into this new safety measure. Establishing that airbag injuries were claiming the lives of children because car designers had not taken passenger stature into account led to what Marraccini describes as a "transition in under-



difficult to autopsy children. "Every victim you the devastation of the surviving parents more and more."

standing" that has brought about beneficial change.

The evolution in police restraint methods represents another such transition. When, in the early eighties, Marraccini first began investigating cases of suspects who had died in police custody, some of these deaths were ruled accidents, others homicides. In judo, Marraccini knew, a competitor will immobilize his opponent's body before applying careful pressure to the carotid artery, causing his opponent to pass out. The carotid sleeper hold—reasonably safe when practiced in a controlled, sporting environment—can turn lethal, however, when applied to a squirming, resisting suspect, as Marraccini and others helped to establish.

Other mysteries remain in the investigative phase; in 1985, Marraccini worked on the case of a child who died suddenly in her sleep, 12 years after she had narrowly escaped death from sudden infant death syndrome (SIDS). The child's tissues are now being reexamined, using molecular probes, to determine if there might be a kind of SIDS death related to prolonged QT interval that medicine has yet to identify.

Marraccini—whose recreational activities include pistol and rifle shooting, archery, the martial arts, and tomahawk and knife-throwing—has, more than once, relied on knowledge acquired outside of his HMS education and the medical examiner's office to solve a mystery. In fact, he says, what makes the medical examiner's job intellectually compelling is having to draw upon a detective's reservoir of information, experience, and intuition.

"Sometimes," he says, "the missing piece of the puzzle can even be related to something that you learned when you

were five years old. I once reviewed a case, for example, in which the victim displayed unusual head wounds. No one could figure out what could possibly have produced such injuries. When I looked at them, I flashed back to an early childhood memory of the damage inflicted when one boy hit another with a piece of coral rock. Sure enough, such a rock was eventually suspected to be the murder weapon in this case."



**DEAD GIVEAWAY:** Marraccini examines a skull with three bullet holes. The skull was found by a construction worker in Boca Raton, Florida.

Knowledge of the local flora and fauna has frequently helped Marraccini, a Florida native, in his job. He once helped evaluate a case by recognizing some baffling injuries on the victim's arm as having been inflicted by the playful gnawings of a pet macaw. Familiarity with the current flows of the local rivers has helped him know where to hunt for evidence dumped in the water. Knowing the kinds of artifacts left by the creatures who inhabit the area has also

played a gruesomely practical role: alligators and snapping turtles produce distinctive marks on corpses. And, Marraccini notes, red ants create a peculiar pattern resembling gunshot wound tattooing, which might mislead someone not familiar with the ants' habit of chewing on blood spots from high velocity spatter around bullet wounds.

Deducing the truth from such clues provided the kind of intellectual and scientific challenges that led to Marraccini's original fascination with his field. Once he became a father, though, he found it increasingly difficult to autopsy children. "You begin to wonder what intervention might have been attempted to prevent a teen suicide," he says. "Every victim you autopsy seems like your own baby, and you vicariously feel the devastation of the surviving parents more and more." For this reason and others, Marraccini found himself, after all those years in the medical examiner's office, wishing he could make more of a difference on a person-to-person level. He now puts in forty hours a week in family practice and ten in forensic work.

Initially, the career transition proved challenging. "Working with the dead for so long made me a bit paranoid when taking patient histories," he says. "At first, I expected every patient to die an untimely death." But his long and intimate knowledge of death and disease, Marraccini has realized, lends him a unique authority when explaining to patients why they need to adopt healthier lifestyles. "It's not every physician," he says, "who can apply lessons learned from 4,000 autopsies to the land of the living." ■

*Beverly Ballaro is assistant editor of the Harvard Medical Alumni Bulletin.*

# microbe

# HUNTER

There once was a cow from the west  
who thought Dr. Brooks was a pest;  
"He says I'm diseased,"  
said the bovine, displeased,  
"and I'm causing the trots in my guests."

NOT MANY PHYSICIANS COULD INSPIRE A PATIENT TO SCRIBBLE A paean such as this, but John Brooks '94 has always marched to a different beat. As a boy of 13, his fascination with the great medical detective narrative *Microbe Hunters* sparked dreams of a career in medicine and foreshadowed his current job as an Epidemic Intelligence Service officer assigned to the Foodborne and Diarrheal Diseases Branch of the Centers for Disease Control and Prevention.

Brooks followed a roundabout path to HMS, majoring in German and earth science as an undergraduate and deferring medical school for several years in order to travel the world. At HMS, he quickly developed a passion for the study of infectious disease, intrigued by the formidable breadth of knowledge it demands.

"Medical epidemiologists must understand everything," he says. "From caring for individual patients to puzzling out the

by BEVERLY BALLARO





# Casting such a wide surveillance net inevitably yields its share

origins of diseases that can ravage entire communities, they must have both a capacity for minute detail and a broad perspective. All medicine is voyeuristic by nature, but epidemiology is especially so."

Constructing an explanation from a mountain of details, Brooks concedes, can seem like hunting for proverbial needles hidden in haystacks. Yet while some may view epidemiology as an imprecise science, Brooks says he thrives on the challenge of tracking down the source of an outbreak, likening it to "solving a 3-D puzzle in which time and geography are two of the dimensions."

## Undercover Work

Chasing down outbreaks requires Brooks to exercise skill not just in microbiology, but also in psychology and cultural diplomacy. His work on a World Health Organization-sponsored polio eradication project in Fiji, for example, took him to remote islands where he discovered that wearing a *sulu* (a traditional skirt-like garment) earned him credibility, and partaking of *kava* (a popularly consumed sedative-like substance) made local community members receptive to his medical initiatives.

These lessons have stood Brooks in good stead. Although the Public Health Service started out as a branch of the Navy and, consequently, Brooks dutifully dons his Commissioned Corps uniform every Wednesday, he never wears it on investigations. "Just think about the intimidation factor," he points out, recalling an outbreak caused by contaminated cheese that affected a population of illegal aliens.

Putting wary patients at ease is essential to the success of Brooks's work. In what he describes as his "most adorable outbreak," he was called upon to investigate a salmonella strain that sickened kindergartners

touring a dairy farm. Brooks traced the problem to the tradition of allowing children to sample unpasteurized milk. To solve the mystery, though, he found himself conducting a scientific investigation for whose rigors HMS had not prepared him.

"Can you imagine what it's like to interview 100 five-year-olds?" he recalls with fond exasperation. "They're just at the age when they're eager to tell stories, but they're not always the most reliable of narrators." The children enthusiastically reported to Brooks how they had drunk "milk from the big, brown cow," but then also had "petted giraffes" and "built snowmen."

## Stranger than Fiction

Like any good detective, Brooks knows that the solutions to mysteries sometimes defy plausibility. He cites the earliest domestic cases of HIV infection—in which young and seemingly healthy gay men were being afflicted by a rare form of pneumonia—as an example of the outlandish emerging as reality. For this reason, he and his colleagues at the CDC treat as potential early warnings all the tips and inquiries that regularly pour into their offices from state health departments, governmental agencies, and the occasional private citizen.

Casting such a wide surveillance net inevitably yields its share of surreal moments. "As a custodian of the public health, you have to respond to every inquiry," Brooks explains, which accounts for why the phone duty log on his desk documents queries such as the one from the woman concerned about the safety of her daughter's swimming in the family pool with her pet goose; the man claiming that an outbreak of listeriosis was due to UFOs adulterating the goats in his back yard; the inmate worried about contracting viral hepatitis from drinking a cup of coffee into which he'd seen a fellow inmate urinate ("If you saw this happen, then

why did you drink it?!"); and the teen wanting to know whether the directions he found on the Internet for manufacturing botulinum toxin would actually work ("No!").

## Public Health Affairs to Remember

Brooks's most memorable outbreak investigations have rounded up their suspects through a combination of sophisticated technologies, case control studies, and a detective's intuition. Last spring, a string of salmonella cases afflicting young women from the lightly populated western part of Colorado had investigators stumped. Epidemiology, like police work, has its own victim profiles; Brooks knew from his branch's long experience with foodborne outbreaks that young women are typically infected by produce in these kinds of outbreaks, yet the usual suspects, such as tomatoes, were not yielding any clues.

Interviews with the women seemed to implicate first an unusual fruit soda, then a dairy-based chocolate filling, but, again, these leads went nowhere. In the end, a case control study revealed a shipment of sprouts as the culprit. An exhaustive check of farm, processing plant, and supermarket records traced the outbreak to a single lot of clover seed. Although the seeds had been soaked in chlorine (the recommended method for decontaminating sprout seed), this measure had reduced—but not eliminated—the risk of contamination.

That same year, Brooks was called in to investigate an *E. coli* diarrheal outbreak in a Texas cheerleading camp. "Interviewing 650 teenage girls about what they'd eaten and how much they'd vomited was quite an experience," he muses. Although microbiological proof was not available, the statistical analysis left little room for reasonable doubt. Brooks identified a major mode of transmission as the girls' habit



of surreal moments.

of dipping their water bottles in large, communal ice buckets.

### Guilty by Suspicion

Frustratingly, some cases resist cracking, despite the most rigorous investigative efforts. In one instance, a major outbreak of listeriosis was traced back to contaminated hot dogs. Most of the bacterial isolates collected from sick patients during this outbreak shared an identical DNA fingerprint. From within this large group of patients, however, Brooks and his colleagues identified a small cluster of *Listeria* isolates with a different DNA fingerprint. An unusual confluence of common denominators suggested a link between the people in this subgroup: they had generally *not* consumed hot dogs; they inhabited the same geographical area; they had Eastern European last names; and, most intriguingly of all, they all shopped at various Polish specialty stores. Although Brooks and his state health department colleagues just *knew* that the connection had to reside in those shops, they were never able to nail the culprit.

The nature of his work often places Brooks in a tough position because he has learned that, although “some operations are just plain dirty and deserve to be shut down, more often than not, it’s well-intentioned people in good companies whose production hygiene meets the minimum standard yet, somehow, a pathogen has managed to wreak havoc. The owners are usually shocked that their product could be responsible for making people sick.”

The consequences of an investigation can be devastating, Brooks says. One apple juice company was nearly bankrupted as a result of the litigation and negative publicity that followed an outbreak. Brooks worries about when to make information public, fully aware that he holds the power to disrupt jobs, reputations, and even local

economies. Nonetheless, he is committed to protecting the public health, regardless of the economic impact.

### Risks and Rewards

Brooks’s job yields great rewards but also requires sacrifices. Being on round-the-clock call to travel to any global hot spot with minimal notice complicates his personal relationships. Frequent overseas travel also precludes his being able to work in clinical care. He misses getting to know patients; while he is proud of taking many little steps to help large numbers of people, he speaks wistfully about the joys of exercising a

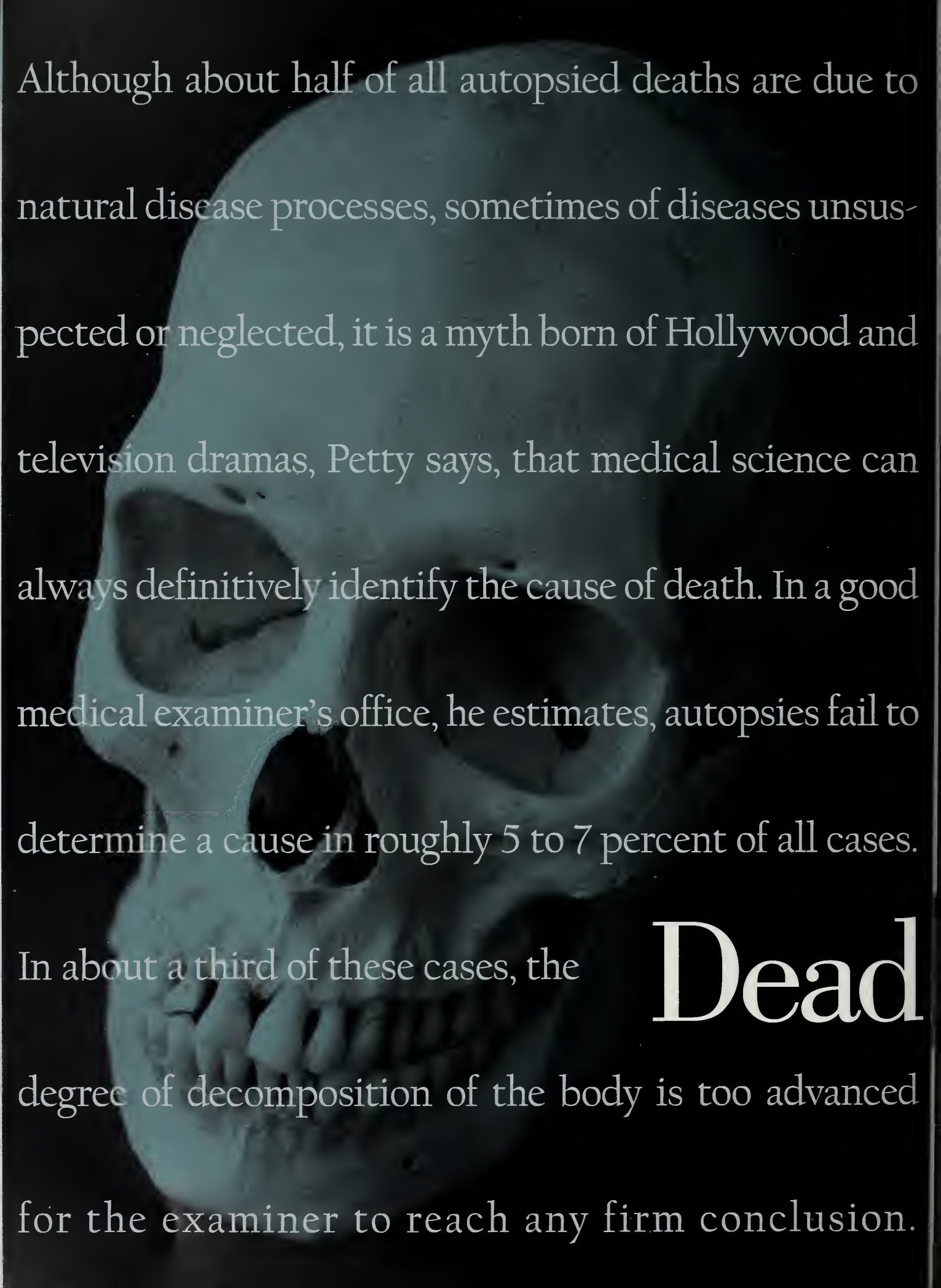
profound, visible impact on individual lives.

Nonetheless, Brooks remains passionate about his work and philosophical about the intangible nature of his success. Last year, for example, he managed a diarrhea surveillance system in Africa that picked up a cholera epidemic early enough to be nipped in the bud. “The irony of this work is that when you do your job well, you can’t prove it,” he says. “We’ll never know how many people would have died, yet the knowledge that many lives were saved is tremendously satisfying.” ■

Beverly Ballaro is assistant editor of the Harvard Medical Alumni Bulletin.



**LUCK OF THE DRAW:** Brooks and colleagues have helped prevent the spread of infectious disease in Kenya through surveillance and public health education programs.



Although about half of all autopsied deaths are due to natural disease processes, sometimes of diseases unsuspected or neglected, it is a myth born of Hollywood and television dramas, Petty says, that medical science can always definitively identify the cause of death. In a good medical examiner's office, he estimates, autopsies fail to determine a cause in roughly 5 to 7 percent of all cases.

In about a third of these cases, the **Dead** degree of decomposition of the body is too advanced for the examiner to reach any firm conclusion.



**A**S A YOUNG MAN, CHARLES PETTY '50 ABSORBED TWO VALU-  
able, and not unrelated, lessons: human nature is  
capable of truly insidious deeds; and, the discerning  
eye can see that things are not always as they appear.  
As an organic chemistry student, he had been  
intrigued by a case his professor described of a  
woman who had died suddenly and violently. By  
dumping the contents of the woman's sugar bowl  
onto a clean piece of paper, and watching them sepa-  
rate into two components—sugar and arsenic triox-  
ide—the suspicious professor was able to prove that  
the woman had been poisoned.

At HMS, Petty's fascination with medical detec-  
tive work was sparked anew when he spotted an  
unusual display in the Warren Anatomical Museum:  
an old, cast iron, potbellied stove that, remarkably,  
had been partially melted down. He learned that  
George Burgess McGrath, venerable professor of  
legal medicine at HMS, had used the stove as proof

# Men Do Tell Tales

*by* BEVERLY BALLARO

# Even the seemingly straightforward criminal cases

that a man had detonated a thermite bomb to ignite a conflagration that he vainly hoped would cover up his wife's murder.

Petty entered the field of forensic pathology because he realized that not all medicine is about directly treating patients, and that the application of scientific and medical knowledge can serve other, equally important healing purposes. "When a mother discovers her four-month-old dead in his crib, she wants to know why her child died," he says. "I can relieve her of some of her guilt by explaining that the child did not die 'on her watch'—that his death was not her fault. It's almost like providing psychotherapy. I also act as a protector of the public health by uncovering hazards. Although it's misunderstood by many, this field is really about helping people."

## Readings from the Book of the Dead

**A**mong his many distinguished professional roles, Petty is a professor of forensic sciences and pathology at the University of Texas Southwestern Medical Center at Dallas. He has also worked as chief medical examiner for Dallas County, where he ran the crime laboratory. And he has served as director of the Dallas County Rape Crisis and Child Sexual Abuse Center.

Although Petty has worked many criminal cases in his career, he does not dwell on the evils he has witnessed, but focuses instead on the problems to be solved. "Doing an autopsy is interesting," he says, "because dead men really *do* tell tales." In personally conducting more than 13,500 autopsies and supervising another 40,000 to 50,000 throughout his career, Petty has helped to unravel many a mysterious tale.

Sometimes, solving the puzzle requires detective work of the old-fashioned variety. Petty once investigated the case of a seemingly robust and healthy man in his late twenties who was found

dead in his well-appointed apartment, with no evidence of foul play. A routine check of local hospital records brought to light that the young man had, in fact, undergone electrocardiograms that had identified prolonged QT interval, a condition that makes its carriers prone to sudden and unexpected death.

Occasionally, the solution to a case turns up through serendipity. A physician once sent Petty the body of a woman for examination. The physician also passed along an uncannily familiar description of the symptoms the woman had exhibited right before she died. Petty just happened, at that time, to be engaged by the government in research on developing a human anti-botulinum serum. An analysis of the woman's bowel contents confirmed Petty's immediate suspicion that she had died of accidental poisoning, due in this case, it turned out, to tainted canned tomatoes.

Petty has also handled cases whose results defied all plausible expectations. When an associate asked him to conduct an autopsy on his wife, who had died mysteriously, Petty agreed to help. When he phoned his colleague to inform him that his wife had died of a brain metastasis from a thyroid carcinoma, the man was stunned into silence. His wife had, indeed, undergone surgery for the removal of her cancerous thyroid—25 years earlier.

## To Catch a Killer

**T**he criminal cases Petty has investigated provide sad evidence of human psychological, rather than physiological, processes gone pathologically awry. Some years ago, he was brought in to solve the mystery of what had killed a young woman found dead in the bedroom of her home. The victim was apparently unscathed, and there was no evidence of a robbery or any type of intrusion.

Petty mulled the layout of the house—which featured a garage on

the north side, bedrooms on the south side, and a swimming pool in the yard—and concocted a chilling scenario: the woman's husband had taken a hose ordinarily used to clean the pool, and snaked it from a car exhaust pipe in the garage, around the side of the house, and through the bedroom window in order to suffocate his wife with a lethal dose of carbon monoxide. Traces of auto exhaust gas found on the hose and in the victim's blood bore out Petty's theory. As fate would have it, a different distribution of carbon monoxide in the air currents in the house spared the life of the infant who was also sleeping in the bedroom at the time of his mother's murder.

Even the seemingly straightforward criminal cases yield the occasional odd twist, Petty says, recalling one instance in which a tall, obese woman was found, presumably beaten to death, in her own home. Her body was discovered lying in a peculiar position, sprawled on the floor but with one leg propped up on the bed. Petty quickly identified a poker with a missing hook as the suspected murder weapon; the screw threads on the poker made a distinctive and precise match with the injury patterns on the woman's body.

Petty was reluctant to rule that the beating was the cause of death, however, because, the injuries, as horrible as they were, didn't seem to be so severe that they could have been fatal. Petty and his colleagues spent considerable time reviewing the crime scene photos side by side with the autopsy photos before they came to an eerie realization. The woman had, in fact, not died from the beating itself but from asphyxia—the weight of her own enormously heavy leg pressing against her abdomen had stopped her breathing—and the cause of death was officially ruled strangulation by beating.

"The key to getting to the bottom of an unexplained death, whether natural or unnatural," says Petty, "is making a commitment to going all the way in conducting an examination. You can't be



# yield the occasional odd twist.

denied the opportunity to examine the entire body and be expected to figure out the truth of what took place." When he lectures his students, Petty frequently reminds them of one cardinal rule: "When you look at a corpse, that body can and will tell you its story, if you are prepared to look properly."

Petty himself learned this lesson early and the hard way; as a young medical examiner in Baltimore, he was hung out to dry by a defense attorney during a blistering 30-minute interrogation on the implications of his failure to examine the head of a victim. "Failure to examine the whole body is the classic and leading mistake in forensic medicine," he says.

No matter how thorough the autopsy, however, the truth behind mysterious deaths can still occasionally prove elusive. Although about half of all autopsied deaths are due to natural disease processes, sometimes of diseases unsuspected or neglected, it is a myth born of Hollywood and television dramas, Petty says, that medical science can always definitively identify the cause of death. In a good medical examiner's office, he estimates, autopsies fail to determine a cause in roughly 5 to 7 percent of all cases. In about a third of these cases, the degree of decomposition of the body is too advanced for the examiner to reach any firm conclusion. Cases of SIDS—sudden infant death syndrome—account for another third ("we're just too stupid to figure out why these infants die," Petty sighs). The remainder of unexplained deaths generally occur among women in the adolescent through menopausal phases of life for a variety of causes that defy medicine's understanding.

## The Good, the Bad, and the Ugly

**F**orensic pathology, Petty warns, comes with its own unique set of challenges, and any young doctor contemplating a career in the field

should be aware of several points. "One key difference between regular medicine and forensic medicine," Petty says, "is that medical examiners are responsible to the governing authority in the jurisdiction in which they work. A lot of doctors don't particularly like answering to politicians, but there's no escaping such accountability in this field."

He adds that if young doctors are intimidated by testifying in court, they shouldn't even consider entering the field. "Personally, I enjoy testifying," Petty says. "I don't mind being called a liar and having to defend my opinions, because I know I'm a good witness. Sometimes, I've testified in as many as four cases in a single day."

Petty also emphasizes that forensic scientists must exercise extraordinary self-discipline and diligence to remain fair and impartial. "You have to be able to look at both sides of the question. Regular doctors are bound by the Hippocratic oath and convention, but forensic scientists are responsible for crafting and maintaining their own ethics; 80 percent of what we do is strictly confidential."

"Unfortunately, too many medical examiners end up becoming permanent witnesses for the prosecution; that's unfair and unhealthy. After testifying in case after case, they can begin to take on an almost God-like persona. The idea that a medical examiner can never be wrong must be avoided at all costs."

But, Petty says, the rewards of the field are great for those who can endure the challenges. "In my career, I've had the privilege of consoling families of victims," he says. "The way in which you can offer some form of comfort to the suffering parents of a child dead by suicide or SIDS, for example, can be an enriching experience."



**GRAVE MATTERS:** Meticulous observations coupled with shrewd deductions have helped Petty bring closure to many mysterious deaths.

Petty has also relished the opportunities he has had to lecture to police and public health officials, and even to shape national policy. For 25 years, he has volunteered with the National Law Enforcement and Corrections Technical Advisory Committee, making recommendations on everything from the use of pepper spray to body armor. And although the strict confidentiality of so much of the work of a medical examiner creates its own burdens and sense of isolation, it can also be liberating. "Unlike most doctors," Petty says, "medical examiners get to work as they wish, free from certain pressures and agendas."

Yet the most gratifying aspect of his field is also perhaps the most ironic. Although his professional expertise focuses on the dead, the exercise of that knowledge has placed him squarely at the center of his community. "Ultimately," Petty says, "I have worked hard to bring justice and consolation to the living." ■

Beverly Ballaro is assistant editor of the Harvard Medical Alumni Bulletin.

# *the* tell-tale heart

An infectious disease expert investigates how human attitudes and behaviors can promote—or imperil—a healthy society

SOLVING MEDICAL MYSTERIES COMES naturally to Judith Wasserheit '78, whose unconventional childhood made her realize that she wanted to be a doctor even before she reached kindergarten. Her early role model was her mother, a podiatrist whose juggling act as a practitioner, professor, and parent was considered “pretty outrageous” for a woman in the 1950s. As a child, Wasserheit often accompanied her mother to nat-

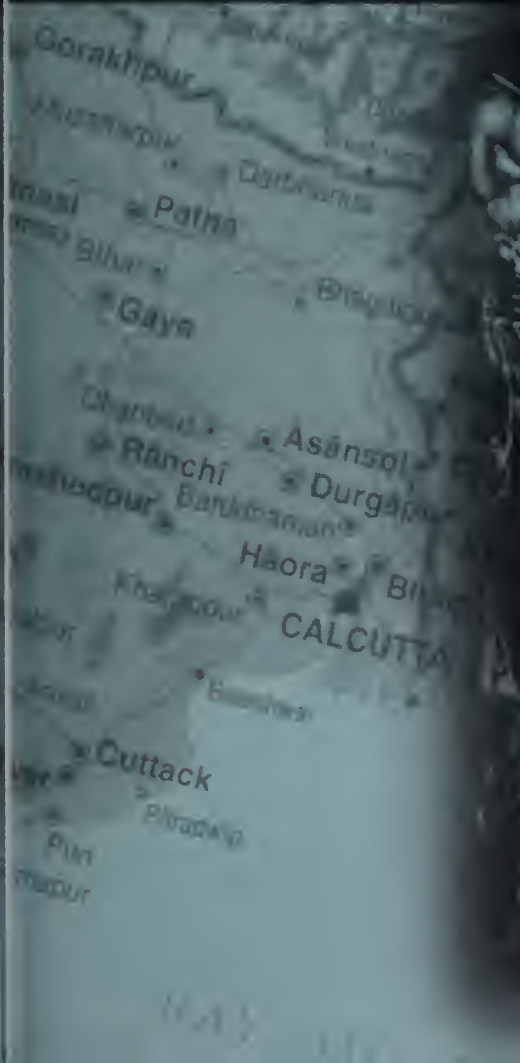
ional meetings—and tagged along to medical lectures.

Her mother's position as chair of a department of special anatomy offered Wasserheit other precocious exposures to medicine. “I grew up with feet and legs in the freezer at home,” she recalls. “For my 13th birthday, my mother's gift was my very own cadaver. We used to go to the college of podiatry and dissect it together. It was a fabulous learning experience, though

ILLUSTRATION CAROLYNN DECILLO

*by* BEVERLY BALLARO





# Like most detectives, Wasserheit is intrigued by the human

the odor of formaldehyde had a definite impact on my social life!"

Although her current job with the Centers for Disease Control and Prevention—where she is director of the Division of STD Prevention—requires medical detective work on a national scale, Wasserheit did not always intend to work in the field of infectious disease. "At HMS, I really had no appreciation for public health," she confesses. "I didn't consider it 'hard core' enough compared to the other science courses I was taking."

A rotation in a jungle hospital in Colombia transformed Wasserheit's perspective—and her future. "I was clobbered over the head by the glaring contrast between medicine as practiced back in Boston and in this part of the developing world," she remembers. "For the first time, I was deeply struck by the reality that people live either in communities that reinforce healthy behaviors, or in circumstances that make healthy living incredibly difficult."

The inequities that she witnessed in Colombia sparked Wasserheit's passion for studying disease and wellness in a broad context. "The truth is that curative care often comes too little and too late for many people in the world," she says, recalling one heartbreaking experience she had while working in a refugee camp in Thailand. A Cambodian girl was suffering from a congenital cardiac defect. Although the problem was easily correctable by surgery, officials decided not to use scarce resources by sending her to Bangkok for the procedure, because they knew she would not receive the necessary postoperative care in the camp.

Wasserheit, who completed internships in both internal medicine and surgery, gravitated toward the field of infectious disease in part because of experiences such as the one in Thailand. "Eventually, I began to think that infectious disease was a particularly wonderful branch of medicine," she says. "Not only do you get to work with mostly young, otherwise healthy people, but you can actually heal them."

Like most detectives, Wasserheit is also intrigued by the human stories uncovered in the course of solving a mystery. "In this field, you can legitimately ask people where they've traveled, what they've eaten, what pets they keep, and whom they've slept with—and then you can cure them. How many jobs allow you to do that?"

## Beyond Bugs and Drugs

Conducting population-level clinical and epidemiologic research requires knowledge of both microbiological and sociological factors. As Wasserheit explains, "It's not just about bugs and drugs. To reconstruct events, you have to understand bugs and human behaviors and communities."

The trickiest investigations can require a delicate negotiation of linguistic sensitivities and cultural taboos. In one of her first forays into population-level research, Wasserheit carried out a study of risk factors for STDs among rural Bangladeshi women and the impact of such diseases on their lives.

Local officials were initially aghast at the notion of asking women in this conservative Muslim country about issues related to sex and reproduction. Wasserheit quickly learned that knowing *how* to ask questions was crucial to her efforts. She took care to name her investigation a study of "reproductive tract infections" rather than STDs. She also framed the study for participants in terms of its relevance to successful childbearing, which was of crucial value in that society.

To avoid having to rely exclusively on interpreters, Wasserheit spent six months in a monastery studying intensive Bengali. And she paid attention to how she dressed; wearing Western clothing in a rural health center intimidated local women, she discovered, so she traded in her white coat for a *sari*. The *sari* proved key not only because it demonstrated respect for her patients, but also because it signaled Wasserheit's status as a married woman—only a mar-

ried woman, local culture dictated, could properly engage in as intimate an activity as conducting a pelvic exam on another woman.

By helping the women understand the connection between their health and their fertility, Wasserheit was able to gather valuable information and promote healthy goals. She discovered that rural Bangladeshi women, once made comfortable, actually relished the opportunity to talk about sex, their husbands, and other topics considered taboo. "Much of their initial reticence stemmed from living in a culture frightened of and conflicted about sexuality, not unlike what you see in many parts of our own society," she says.

Lessons learned about how to negotiate such fear and ambivalence helped Wasserheit when she returned to the United States, first to join the faculty at Johns Hopkins, and later to serve as the first chief of a national STD research branch at the National Institutes of Health. As she began working with a population of young, indigent, and poorly educated women, she was startled to find the conditions in Baltimore remarkably—and depressingly—similar to those she had encountered in Bangladesh.

## Motives and Opportunities

In her current position at the CDC, Wasserheit oversees investigations at multiple levels. Sometimes, the mystery in question involves an outbreak on a large scale. Wasserheit's division has been working with local public health officials, for example, on newly emerging resistances to antibiotics for gonorrhea in locations as far-flung as Kansas and Hawaii.

But often the challenge has less to do with tracking down bugs than stirring up people; it is Wasserheit's responsibility not only to oversee her division's research, but also to produce results across the nation. She acknowledges that changes in policy struggle to keep pace with research breakthroughs.



# stories uncovered in the course of solving a mystery.

"Translating research into routine practice is incredibly difficult," Wasserheit says. "Most research is conducted in rarefied environments, but in the real world, there are issues around training, staffing, financing, politics, and sometimes just plain old inertia."

The gap between knowledge and practice can be maddening. Wasserheit points out one study's conclusion that two appropriately designed 20-minute counseling sessions in STD clinics increased condom use as effectively as more elaborate, expensive interventions, but the simpler, cheaper solution has yet to become standard practice anywhere in the country. Another study, by Seattle investigators, demonstrated that selective screening and treatment for chlamydia for women in managed care can reduce pelvic inflammatory disease by an astonishing 60 percent; such screenings are not yet routine in the United States, even in the very practices in which the study was conducted.

Despite such frustrations, Wasserheit enjoys her successes and derives satisfaction from making a difference on a national level. "We are moving, albeit incrementally and painfully, in the right direction," she says. "People are beginning to appreciate that health can be achieved through community-wide collaborations and mobilizations."

She notes, for example, that syphilis rates over the past two years have been the lowest ever recorded, and that a tiny fraction of communities account for a staggering percentage of the cases that are reported. To meet the surgeon general's announced goal of eliminating syphilis by 2005, Wasserheit and her colleagues have been working with those communities at risk to understand why they are vulnerable, and to help them take sustainable actions to improve their health.

What the investigators have confirmed is that the map for syphilis looks strikingly similar to the maps for HIV infection, high infant mortality rates, and shortened projected lifespans. "Clearly," Wasserheit says, "the barriers are not biomedical in



**SMALL WORLD:** Working for healthy mothers and babies has brought Wasserheit to communities around the globe, including some in Bangladesh.

nature. We can detect and cure syphilis. The real mystery lies in how to overcome the societal issues that perpetuate this highly stigmatizing disease. It's a question of coming to grips with fractures in the health care system, substance abuse, and racism. Until we, as a society, can look each other in the eye and not only say that we're all equals, but really believe it, we're going to have to suffer the consequences."

## Future Challenges

As a physician, but especially as the mother of a six-year-old son, Wasserheit is committed to puzzling out the causes of—and solutions to—some of the country's toughest health challenges. She is especially passionate in her contention that society must do a better job of teaching all young people how to establish healthy behaviors early in life.

Last summer, when she worked with other researchers and public health officials examining health services for adolescents in the San Francisco Bay Area, Wasserheit learned that, particularly for teens considered high risk, the issue was not usually a lack of appropriate and

accessible resources, as many had assumed. The problem often lay, instead, in the reality that these young people did not feel valued and, consequently, did not perceive investing time and energy into their health as a priority. Changing this perception is crucial, she believes, to the future health of society.

Reflecting on the kind of nation she would wish for her son by the time he reaches adolescence, Wasserheit is cautiously optimistic that some of our most urgent medical mysteries will be, if not solved, at least manageable. She envisions, for example, that scientific breakthroughs will lead to vaccines and home-based tests for several STDs. Just as fervently, however, she hopes for fundamental shifts in human attitudes. Her vision for the future features a society in which people can talk openly about healthy sexuality, adolescents feel connected to communities that value their health, and race-based disparities in care have been dramatically lessened, if not eliminated. "And that," she says, "is a pretty tall order." ■

*Beverly Ballaro is assistant editor of the Harvard Medical Alumni Bulletin.*

by ANTHONY S. PATTON

# MURDER

**SCENE OF THE CRIME:**  
John Webster's chemistry  
laboratory was located  
in the basement of  
Harvard's medical  
college (right), which  
faced Massachusetts  
General Hospital (left).

ON THE MORNING OF NOVEMBER 23, 1849, GEORGE PARKMAN donned a purple silk vest, a dark frock coat and trousers, and a black stovepipe hat. He strode purposefully through the West End of Boston, his lower jaw jutting forward in the characteristic way that had earned him the moniker "The Chin." He collected rent from several tenants, purchased a head of lettuce at Quincy Market for his ailing daughter, and stopped to order butter and sugar from a





# MOST HARVARD

A brutal slaying at Harvard Medical School led to one of the world's first applications of forensic evidence in court



G

# George Parkman did not leave the building alive.

local grocer. He then mounted the steps of Harvard's medical college,\* a building that had been opened, amid much pomp and circumstance, just three years earlier on land donated by Parkman himself.

Parkman regarded the medical college as something of a jewel in his real estate empire and proudly called it "a piece of the Holy Land." During that Friday before Thanksgiving, however, the medical college was about to play host to events far removed from the sacred; George Parkman, esteemed Harvard alumnus, physician, and real estate mogul, did not leave the building alive.

In 33 years of marriage, Parkman had never before missed his two o'clock dinner. After staying up all night awaiting his return, his tearful wife at last summoned relatives, who immediately suspected foul play. Handbills were distributed and generous rewards offered. Wild rumors about Parkman's whereabouts percolated throughout the city. For a full week, Bostonians ransacked Parkman's West End tenements, interrogated bridge and turnpike attendants, and dragged the Charles River. Police searched the medical college and combed the marshy wooded land beyond the hospital. In the growing climate of hysteria, an Irishman was detained for questioning when he tried to pay a toll with a twenty-dollar bill; no Irishman, the thinking went, could possibly have come upon that much money by honest means.

Two days after Parkman mysteriously vanished, his wife received a visitor. John White Webster, a longtime family friend, stopped by to inform the Parkmans that he had seen George the afternoon of his disappearance, at which time he had paid the doctor his debt in full. Web-

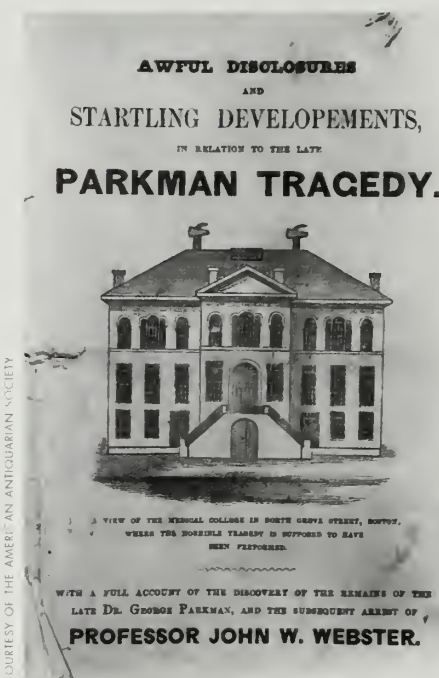
Their surprise quickly turned to a nagging suspicion that would soon help set in motion what became the most sensational trial in nineteenth-century America.

## The Bitter Brahmin

At age 59, Parkman cut a distinguished, if austere, figure among Boston's elite. Tall and almost painfully thin, with a demeanor that suggested discipline and righteousness, he had elicited the admiration of the dean of Harvard's medical college, Oliver Wendell Holmes, who stated, "He abstained while others indulged, he walked while others rode, he worked while others slept." Parkman had parlayed his sizable inheritance into a real estate fortune, and he exuded an air of smug self-satisfaction. Ever the frugal Yankee, he refused to keep a carriage. Every day the citizens of Boston could set their watches by the rounds he made on foot, collecting rents and conducting his business with a punctiliousness that some thought occasionally bordered on cruelty.

Although his family was rich, generous, and powerful, Parkman's life had seen its disappointments. His daughter was sickly, and his son had not lived up to his expectations.

Most irksome of all, he had not realized his dream of becoming a pioneer in the treatment of mental illness. Early in his career, after attending lectures at Harvard's medical college and earning his medical degree in Scotland, he had spent time observing the work of



**AWFUL DISCLOSURES:** A trial pamphlet provided inquiring minds with details of the Parkman murder case.

ster's cold, detached demeanor took the Parkmans by surprise; Parkman, after all, had not only lent Webster considerable money over the years, but had also played an instrumental role in Webster's faculty appointment at Harvard's medical college.

## PROFESSION

Real estate entrepreneur, physician, and philanthropist

## LAST SEEN

Entering Harvard's medical college around one o'clock on Friday, November 23, 1849

## THE VICTIM

DR. GEORGE PARKMAN





PARKMAN STRODE ALONG TREMONT STREET ON HIS FINAL JOURNEY THROUGH BOSTON

physician Philippe Pinel at an insane asylum in Paris. At that time, treatment for those with chronic mental illnesses tended to be primitive and punitive. Inmates suffered under harsh conditions and were often chained to walls. Pinel instead espoused kindness for his patients. He released their chains, fed them nutritious food, and tried to create a healthy program of exercise and fresh air. The young Parkman was greatly impressed with the exciting results of this new treatment.

Parkman returned to the United States planning to help start the Massachusetts Mental Hospital—now McLean Hospital—and even provided seed money for the project. Officials at Massachusetts General Hospital had agreed to the idea, and Parkman was keen to be the new superintendent. He was crushed to learn, however, that despite his position, wealth, and qualifications, he had been passed over in favor of another physician. He took the rejection hard and turned much of his

attention to managing his family's enormous real estate holdings. Nonetheless, as the author of *Remarks on Insanity* and *The Management of Lunatics*, he was occasionally called to court to testify as to the motives and mental states of violent criminals, and so he continued to be regarded as an authority on mental illness.

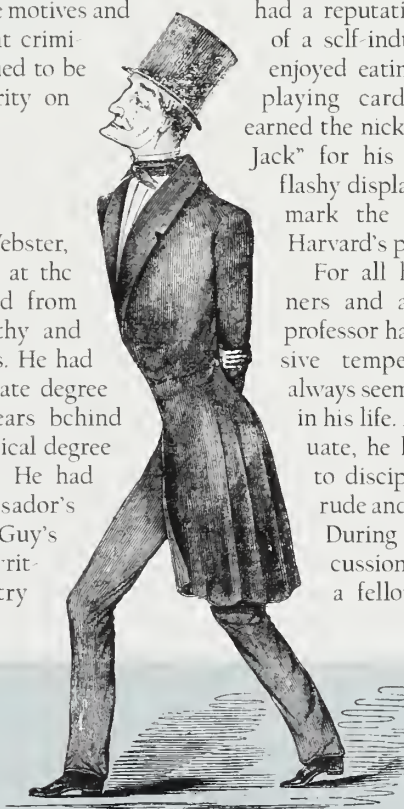
### Skyrocket Jack

Like Parkman, John Webster, professor of chemistry at the medical college, hailed from one of Boston's wealthy and prestigious old families. He had earned his undergraduate degree from Harvard two years behind Parkman, then his medical degree from Harvard in 1815. He had married an ambassador's daughter, trained at Guy's Hospital in London, written a college chemistry

textbook, and helped found the *New England Journal of Medicine*.

Yet Webster sported a frivolous side. In sharp contrast to Parkman, the shrewd and sober Yankee, Webster had a reputation as something of a self-indulgent dandy; he enjoyed eating, drinking, and playing cards, and he had earned the nickname "Skyrocket Jack" for his insistence on a flashy display of fireworks to mark the inauguration of Harvard's president.

For all his genteel manners and associations, the professor harbored an explosive temper, and trouble always seemed to be brewing in his life. As an undergraduate, he had been subject to disciplinary action for rude and unruly behavior. During one spirited discussion, Webster struck a fellow student with



### FOUND

Friday, November 30, 1849  
in various hiding places  
around the medical college

### CAUSE OF DEATH

A blow to the head with a  
large stick; his body was then  
dismembered and burned

his cane, a blow that could have been fatal had it landed on its target's head. On another occasion, Webster attacked a colleague in a barbershop for an uncomplimentary remark meant as a joke. Even family members questioned exactly what happened at Guy's Hospital when he was forced to leave abruptly. There were whispers of violence, even assault and rape.

Disturbing questions about Webster's behavior trailed him into adulthood. When a chemistry experiment he performed caused an explosion, nearly injuring a student, Webster trivialized the episode in an unpleasantly cavalier fashion. On another occasion, he cruelly beat a stray dog to demonstrate head injuries. And then there was the destitute cousin whose meager inheritance Webster was rumored to have stolen. It did not help that his students disliked him and laughed at him during lectures.

For the most part, however, Webster seemed to fit in well with the other professors. He lived in fine fashion not far from Harvard Square, in a series of large houses with all the amenities, including servants. The Websters hosted many parties, and their daughters always had the finest tutoring and music lessons. Their friends included the intelligentsia and social elite of the time.

Unfortunately, Webster's extravagant tastes exceeded his means. He had frittered away a family inheritance, spending lavishly to amass a fine mineral col-

lection and squandering \$3,000 on the purchase of the skeleton of a woolly mammoth. His lectures, which were supported by student subscriptions, did poorly, and his \$1,200-a-year stipend from the medical college was soon to be cut by almost one-fifth. His family had already been forced to move once and, as their resources dwindled, he became concerned about losing their house again. In desperation, he began to borrow heavily from friends. Finally, he had no choice but to offer up his mineral collection as collateral for a loan from George Parkman. When, purely by chance, Parkman discovered that Webster had put up his collection as collateral for another loan, he felt that he had been swindled and became enraged.

Parkman, who had known Webster for decades, was well aware that Webster lived beyond his means and was only a mediocre professor. Despite his sour disapproval of what he regarded as Webster's excesses and deficiencies, Parkman had agreed to lend him money partly out of sympathy for Webster's family. When he became convinced that Webster had defrauded him, however, Parkman began to hound the professor, publicly accosting him about the debt. He would haunt Webster's Harvard lectures, waiting in the back of the hall to confront the professor after class, speaking loudly so others could hear. He threatened exposure and intimated that Webster's professorship was at stake. He was relentless in demanding satisfaction. On the morning of the disappearance, Webster went to Parkman's house to schedule an appointment for that afternoon.

### Pieces of the Puzzle

In its fifth and penultimate location since its creation in 1782, Harvard's medical college squatted on the tidal flats of the Charles River facing Massachusetts General Hospital. The red brick building served as the main location for lectures. Classes were held on the top two floors, and the basement housed Webster's chemistry laboratory, the dissecting room, and the living quarters of the janitor's family. Below the basement was a large pit surrounded by brick for the disposal of cadavers; a similar yet smaller structure encased the hole beneath Webster's private privy.

Several witnesses had observed Parkman enter the door of the medical college on the day of his disappearance, but no one had seen him exit. The police knew that Parkman had been at the school, so they initiated a search that included the chemistry laboratory. As it turned out, their initial exploration proved not thorough enough.

It was not the authorities, but Ephraim Littlefield, the janitor, who most doggedly suspected the professor. He noted that Webster began to lock his laboratory door at all times. He also realized that the furnace in Webster's laboratory was being stoked with a great deal of wood; its heat could even be felt through the wall. Behind the locked door, Littlefield could hear the sound of constantly running water. Most telling of all, since Parkman's disappearance, Webster had turned uncharacteristically genial. When Webster gave the janitor a Thanksgiving turkey, the first gift he had offered in seven years, the gesture



#### THE PERPETRATOR

DR. JOHN  
WHITE WEBSTER

#### PROFESSION

Professor of chemistry at Harvard's medical college

#### THE CRIME

The grisly slaying of George Parkman, real estate entrepreneur



his family, and blurted, “Did they find *all* the body?”

only heightened Littlefield’s suspicions. It occurred to him that the police had yet to search the professor’s private privy.

While the gift of Webster’s Thanksgiving turkey cooked in his quarters above, and with his wife standing guard, Littlefield undertook the hard, cold, wet climb to reach the crawl space in the lower basement of the medical college. On his own hunch at first, then with the approval of two of the medical college professors, he began to chisel his way through five layers of bricks to reach the privy vault. When he finally broke through, after several hours of cramped, odorous, and unpleasant labor, an appalling sight awaited him. Upon glimpsing three fresh body parts—a pelvis, a complete thigh from hip to knee, and the lower part of a leg—Littlefield bolted for help.

That night, the police transported the shocked Webster from his home to the Leverett Street Jail and charged him with Parkman’s murder. When they dragged him to his laboratory to bear witness to their discoveries, Webster became increasingly distraught. He proclaimed his innocence, demanded to see his family, and blurted, “Did they find *all* the body?” He began to twitch uncontrollably and sweat profusely. It was later discovered that when Webster arrived at the jail, he had surreptitiously swallowed a strychnine pill, which almost killed him.

The next day, police officers, coroners, and other experts swarmed



**EXHIBIT A:** When dentist Nathan Keep testified using plaster casts of Parkman’s jaw, he became the first to offer in court odontological evidence to identify a body.

the medical college. While Webster sobbed in jail, the authorities were making a series of gruesome discoveries in his laboratory. Guided by an unpleasant odor, they were horrified to unearth from the depths of a wooden tea chest a large, half-burnt headless torso, with curling gray hair thickly covering its back. The victim’s head had apparently been sawed off rather crudely. When the investigators loosened a cord encircling the

torso, they realized that it had been eviscerated to make room for a thigh. More grisly bits of evidence emerged from the ashes in Webster’s furnace: pieces of burnt bone, viscera, and—although officials didn’t realize it at the time—the clue that would seal Webster’s fate: a dental plate with two teeth still attached.

### A Well-Appointed Jail Cell

Within several days of his arrest, Webster had recovered from his strychnine poisoning and had begun to develop a defense. Even so, he did not seem to understand the gravity of his situation. It was clear from the beginning that Webster was not about to confess, and no lawyer would take the case. Finally, the court had to appoint two lawyers.

Webster, in the meantime, dedicated himself to making his cell comfortable, and he had family and friends send in all sorts of delicacies: fruit from the Azores, fine cheeses, Madeira tea, imported cigars. His fellow professors and even the president of Harvard visited him to express their support. Many of his Harvard Square cronies took up the theory that Webster’s plight stemmed from the inability of Bostonians to understand a Cambridge gentleman. They found it impossible to believe that he could be connected with such a heinous crime. He was, after all, a Harvard professor.

While his lawyers scrambled to confront the mass of damning evi-

### THE MOTIVE

George Parkman’s insistent demands for payment of debts totaling \$483.64

### THE ALIBI

A note allegedly signed by Parkman that cleared Webster of his debts

### THE VERDICT

Guilty as charged for the crime of willful murder

### THE SENTENCE

Death by hanging, on August 30, 1850

M

ore than 60,000 people came to witness the spectacle.

dence against him, Webster continued to make the most of his time in jail, transforming his stay there into a sort of college reunion. All of his friends from Boston's genteel circles—the Lowells, Treadwells, Cunninghams, Bigelows, and Feltons—descended upon the jail to pay a visit to its celebrity inmate. Webster held court every day, filling up on wine, fine food, and repartee. His lawyers pleaded with him to be more realistic, but Webster never wavered. He continued to deny the overwhelming evidence against him, just as he had denied his strangling debt.

Webster stubbornly clung to his alibi: on that fateful Friday, he said, he had asked Parkman to visit his laboratory. He gave Parkman the \$483.64 owed him, and Parkman took the note, signed it as paid, and left. Webster stated that he had no knowledge of whose remains were in his laboratory; if they were Parkman's, Webster certainly had nothing to do with his demise.

No matter how often his attorneys inquired, Webster insisted that he had no idea how the dismembered body ended up in his laboratory. He even hinted at dark conspiracies by others to claim the reward money. Webster would not permit discussion of any alternative version of his story, and he seemed to think that his lofty social position would answer any case the prosecutors might create.

### The Trial of the Century

Webster's trial, which lasted 11 days in March 1850, was considered to be the most sensational legal proceeding of the nineteenth century. The press swarmed everywhere, and the crowds milling around the courthouse were always large and noisy. More than 60,000 people came to witness the spectacle; to accommodate the crowd, the Boston police rotated people in and out of the courthouse gallery every ten minutes. If they expected to

see a gaunt, evil phantom in the dock, they were disappointed, for the already portly Webster had gained 20 pounds while in prison.

The prosecutors began with the motive: Webster was being hounded by Parkman for an unpaid debt. Littlefield then testified about Webster's odd behavior, the constantly stoked furnace and running water, and his discovery of body parts beneath the privy. The prosecutors went on to describe the professor's behavior on the night he was arrested, and to point out that Webster had been found carrying not only the note canceling his debt, but also a second note involving other creditors that Parkman would never have surren-

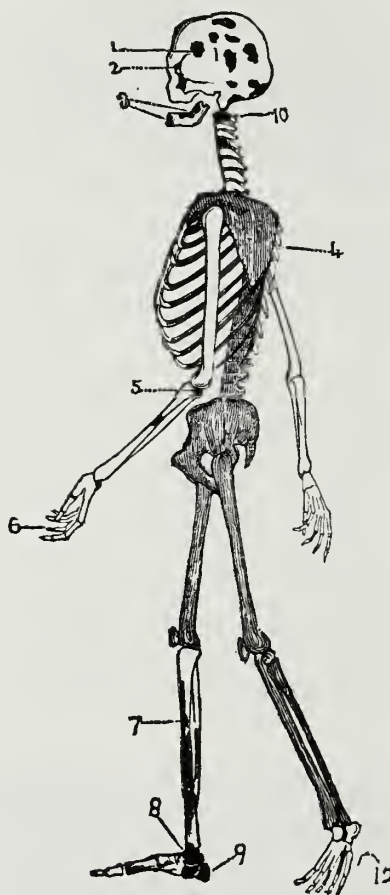
dered to Webster. They then presented a series of letters that had been sent to authorities anonymously. In different scrawls, these letters named other possible suspects and provided fictitious reasons for Parkman's disappearance. Handwriting experts verified that Webster not only had penned those letters himself, but had also forged Parkman's signature on the paid note.

Then there was the overwhelming physical evidence collected from the scene of the crime. Police had found Webster's overalls and carpet slippers spattered with blood. They had recovered his jackknife and butcher's saw, which had apparently been used to dismember the body. And Parkman's grieving widow had identified distinctive marks on what was left of the corpse's back and genitalia.

From the beginning, Webster's defense team faced an uphill battle, yet they made a valiant effort. His lawyers produced several people who swore that they had seen Parkman hours after he was supposed to have been killed. Others testified to Webster's concern about Parkman's disappearance, as well as Webster's fine character and cheerful demeanor around the time that he was alleged to have committed the brutal murder. The evening of the fateful day, in fact, Webster had played whist, recited poetry aloud to his daughters, and deliberated with friends the best method of preserving wedding cake.

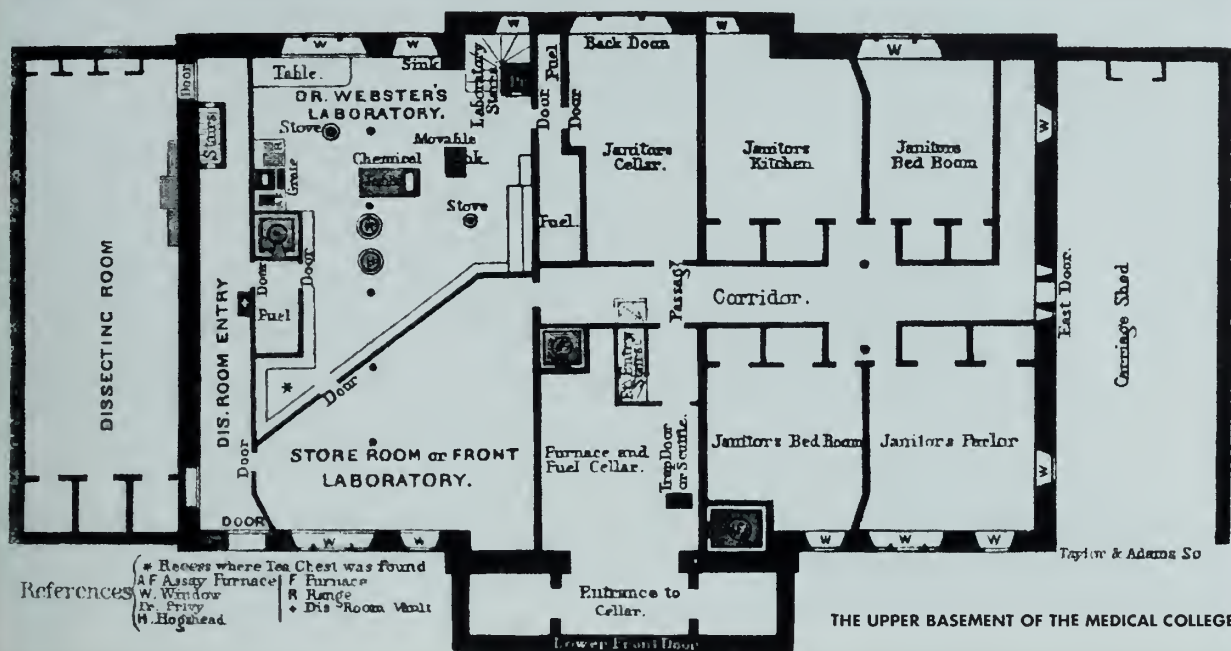
Moreover, Webster's attorneys argued, the case was circumstantial. Who knew if the remains were even those of Parkman? Perhaps someone else's body had been stuffed in the privy. In the end, however, Webster's defense team could not overcome the powerful evidence that the prosecutors had already methodically set forth.

The piece of evidence that eclipsed all doubt also set an important precedent in medical jurisprudence. In one of the first successful applications of forensic medicine in a court of law,



**EXHIBIT B: Parkman's skeleton was reconstructed using more than 150 bones, fragments, and body parts.**





authorities made a positive identification of Parkman's corpse using the jaw and set of teeth that they had recovered from the furnace in Webster's laboratory. Investigators had sent this evidence to Parkman's dentist, Nathan Keep (later appointed the first dean of the Harvard School of Dental Medicine), who identified the false teeth as being those of Parkman.

On the stand, Keep—a close friend of both the murder victim and the accused—demonstrated how the original mold he had cast for Parkman perfectly matched the jaw found in the furnace. He wept as he recounted how he had finished filing down the teeth just in time for a special occasion for Parkman—the 1846 dedication of Harvard's medical college building on Parkman's "piece of the Holy Land."

### Murder Will Out

The jury delivered a guilty verdict in just three hours. The jurors seem to have felt pity for Webster, for they spent all but five minutes of the deliberation period in prayer, eager "to put off the sorrowful duty." Two days later, Webster was sentenced to death by hanging. When the sentence was read, he began sobbing, and his forehead fell abruptly against the bar of the prisoner's dock.

Webster tried two appeals, one that stated his innocence, then a second one in which he confessed to the crime, at the urging of a local minister. His confession portrayed him as the victim of Parkman's vindictiveness. When they met in the chemistry laboratory that Friday afternoon, Webster recounted, Parkman had thundered at him, "I got you into your position, and now I will get you out of it!"

"While he was speaking and gesturing in the most violent and menacing manner," Webster stated, "I seized whatever thing was nearest me, a stick of wood, and dealt him a blow with all the force that passion could summon. I did not know, nor think, nor care where I should hit him, nor how hard, nor what the effects should be. He fell to the floor instantly. He did not move."

Webster claimed that he then panicked, carved up Parkman's body, burned the parts that fit in the furnace, and stuffed the pieces that were too big into the privy hole and the tea chest. "All I could see was the need to conceal Dr. Parkman's body," Webster explained, "in order to avoid the blackest disgrace."

But there was too much to excuse, and too many inconsistencies to resolve. Webster had invited Parkman to come to his laboratory even though he had no means of paying off the debt.

He had not summoned help after Parkman fell, and he had dismembered Parkman's body in a most horrible fashion. Webster's confession came too late. Despite the outcries against capital punishment that sounded throughout New England, his appeal was refused.

John Webster was hanged on August 30, 1850. He had requested that his wife and daughters not be told in advance the date of his execution. The jail, however, had many leaks of information, and a crowd gathered to witness the hanging. The night of the execution, under cover of darkness, a crew led by one of his lawyers spirited Webster's body away and buried him in an unmarked grave, perhaps on Copp's Hill. His family never knew his burial place.

After Webster's death, many of the Brahmin rallied to raise money for his impoverished widow and daughters. It is said that the first contribution—a check for \$500—came from Mrs. George Parkman of Boston. ■

*Anthony S. Patton '58 is a retired thoracic and vascular surgeon whose career was centered at Salem Hospital. Patton attended HMS despite his mother's concern that medicine was a poor choice for a profession, for she believed it would always be tainted by John Webster's terrible act.*

**BABY ON BOARD**  
In eastern Kentucky, isolation and treacherous terrain used to jeopardize the lives of mothers and newborns.



# BABIES *in* SADDLE

A surgeon recounts his adventures working alongside nurse-midwives in one of the poorest and least accessible areas of the United States





by FRANK J. LEPREAU, JR.

**I**N THE EARLY DAYS OF THE Frontier Nursing Service, nurse-midwives navigated eastern Kentucky's rough terrain on horseback. One day, so the legend goes, a young boy inquired of his expectant mother, "Mama, where do babies come from?" "Why," she answered, "the midwives bring them in their saddlebags." Since then, this story has been passed on throughout Kentucky's mountain communities.

Eastern Kentucky is all hills and hollows, and in the tiny town of Hyden, nestled at the bottom of one of those hollows, it is said that the only way to see the sun shine is to lie on your back between 10:00 a.m. and 4:00 p.m. I first arrived in Hyden in 1973 to embark on a two-year stint as the medical director of the Frontier Nursing Service, a pioneering program that trains and sends nurse-midwives to the homes of expectant mothers. There I found a primitive wooden hospital with a single operating room the size of a large closet,

# Breckinridge was involved in all details, including matching the temperaments of the horses with those of the midwives.

complete with a wet mop and mousetrap in the corner. Fortunately, my previous experiences in Haiti and Kenya had accustomed me to working with a minimal support system.

As the service's only surgeon, I performed a fair amount of complicated surgery and many Caesareans, although Anne Wasson, a general practitioner, also performed Caesareans and many other surgical procedures. I quickly discovered, however, that years of exposure to the Frontier Nursing Service had taught the local women that a surgeon's skills were secondary to those of the trusted nurse-midwife. It was not long into my tenure before I, too, began to share a profound respect for the competence and devotion with which the midwives served their patients in this hardscrabble region.

## Heroines on Horseback

In the early 1900s, American women were more likely to die in childbirth than from any

disease other than tuberculosis. The mortality rate was especially high in rural areas, where doctors and hospitals were scarce. And in eastern Kentucky, where women married young and gave birth to an average of nine children, isolation and tricky terrain further jeopardized the lives of mothers and their newborns.

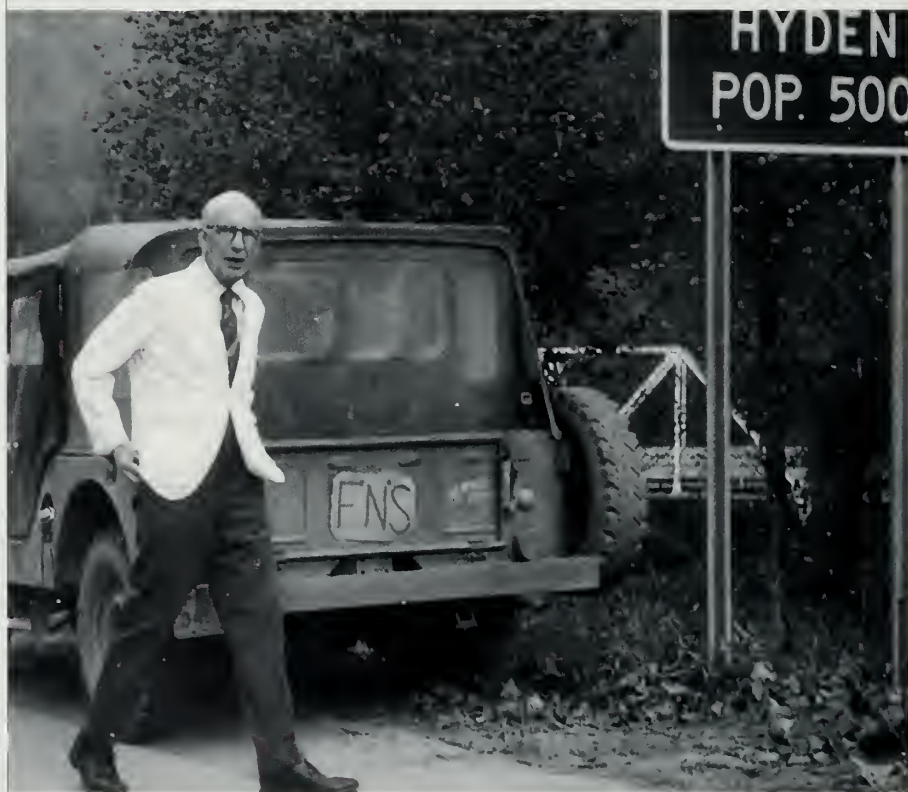
In 1925, after the deaths of her own two young children, Mary Breckinridge, a nurse-midwife with Kentucky roots, founded the Frontier Nursing Service. At first, the nurse-midwives all had to be imported from England, the only country that trained women to practice both professions. Later, when World War II began, the nurse-midwives returned to England. That did not deter Breckinridge, who then founded a midwifery school.

In fact, Breckinridge devoted her life, income, and energy to the people of eastern Kentucky, with a particular concern for pregnant women and their children. "Work for children should begin before they are born, should carry them through their greatest hazard which is childbirth, and should be most intensive during their first six years of life," she wrote. "These are the formative years—whether for their bodies, their minds, or their loving hearts."

Breckinridge was amazingly successful. Her work centered in Hyden, whose population even today is less than 500. She founded Hyden Hospital and, inspired by a similar network in the Hebrides, developed six outpost nursing stations, each located one day's horseback ride from the next. The stations represented a lifesaving contribution to the region, because the few roads that existed were mostly dirt, often muddy, and sometimes completely flooded. There were no telephones, so all communication took place by short-wave radio or courier.

Two registered nurses, one of whom was a certified nurse-midwife, lived at each station. These women performed the deliveries and attended to all other health care needs in a 700-square-mile area. They provided prenatal services, visiting their patients biweekly until the seventh month and weekly thereafter. To reach

**MAKING ROUNDS:**  
Frank J. Lepreau, Jr.  
'38 walks behind a  
Frontier Nursing Service  
jeep in 1975. The jeep  
had replaced the horse  
as the principal means  
of transporting medical  
personnel through  
eastern Kentucky.







their patients, they would ride their horses up mountains and across streams, often fighting their way through blizzards, floods, and blinding fog.

Breckinridge was involved in all the details of the service, including matching the temperaments of the horses with those of the midwives. She made riding lessons mandatory after one frightened midwife held the reins of a horse so tightly that Breckinridge had to rescue the horse, which she described as being drawn up on his hind legs, with imploring eyes and "forepaws wagging like a dog's."

Breckinridge even found someone to custom-make the nurses' saddlebags for \$13 a pair. Each nurse had two bags, one with a white lining for midwifery needs, the other with a blue-checked lining for general nursing. When packed with supplies, the midwifery bags weighed as much as 30 pounds. "The utmost care has to be taken to have the weight evenly distributed or there might be trouble with the horse's back," Breckinridge wrote. "A bad back on a horse in the Frontier

Nursing Service has always been the same kind of disgrace as a bad back on a patient in a hospital bed."

The nurse-midwives continued to rely on horses to reach their patients until coal mining became very active. The coal trucks would careen around treacherously narrow, often wet or icy roads. These trucks made traveling on horseback too dangerous, so the nurse-midwives switched to jeeps.

In the service's early days, a physician also would make the rounds of the nursing stations on horseback, visiting each one of them during the course of a week. By the 1970s, roads had improved enough to allow jeeps to replace horses as the most efficient means by which physicians could make their rounds. Even so, I once had to drive a jeep up a stream to make a house call.

Between 1925 and 1975, the Frontier Nursing Service boasted a remarkable record of 17,000 deliveries with only eleven maternal deaths. Almost all of the deliveries were in the women's homes, often in primitive conditions.

**HORSE CALLS:** A nurse-midwife sits astride her horse at Red Bird, one of the outpost stations of the Frontier Nursing Service. Nurses new to the service were required to take riding lessons.



**ROAD LESS TRAVELLED:**  
For several months  
during the year he  
graduated from HMS,  
pediatrician Edwin  
Adams Harper '31 vol-  
unteered at the Fron-  
tier Nursing Service.

These nurse-midwives not only were skilled in handling cases, but were also cognizant of when it was necessary to call for a physician or to transport a patient to a hospital with the appropriate equipment.

By the time I joined the service, the danger of having an obstetrical disaster was remote, because the prenatal care was great, the nurses were fantastic, and the roads were good enough to allow most births to take place in a hospital.

### A World of Difference

I jumped at the opportunity to join the Frontier Nursing Service when I spotted a notice in the *New England Journal of Medicine* soliciting a medical director. The service was well known among missionary groups and other "do-gooders," and I had been hearing positive reports about its work for some time.

## If an old washing machine fact, abandoned washing

I had just returned to my clinic in Fall River, Massachusetts after spending ten years in Haiti. Despite the warm welcome home, I found myself in a state of culture shock; when I attended a fancy event on the Cape, I was appalled to see food thrown away so casually when, just two weeks earlier, I had been surrounded by starving people.

So I fled modern America and again found myself working among impoverished and needy people. My wife and I lived right on the grounds of the service, in a house balanced precariously on the side of a steep hill. The angle of descent was so sharp that, several years before we arrived, the house had slid partially free of its foundation, shattering all of its pipes in the process.

I liked eastern Kentucky, but when we lived there from 1973 to 1975, daily living could be bleak. Although there were some well-kept houses with flower gardens, on my house calls, I would often see a small stove with loose coal piled up nearby, and the house would be a handyman's special. Wash was usually hung out on the porch, and if an old washing machine broke, its owners would roll it down the closest hill. In fact, abandoned washing machines, refrigerators, and automobiles littered the streams.

Eastern Kentucky was then, as it is now, a gun culture. Pickup trucks would have rifles slung along the back windows of the cabs, and my scrub nurse even carried a derringer. Repeated trespassing despite several warnings by the owner might result in a shooting, sometimes fatal. A perfunctory trial would usually exonerate the owner.

During my tenure there, some counties had to go "dry" because of problems with alcoholism, and moonshiners were still making illegal whiskey. One morning, as the nurses came to work, one of them commented, "There sure were a lot of fireworks on Asher's branch last night." When I asked what she meant, she replied, "There were a lot of gunshots because the Feds were raiding a still."

Unemployment rates also ran high. The main source of income was soft-coal mining—which was in fast decline—and lumbering. (Indeed, the official post office was Thousand-



broke, its owners would roll it down the closest hill. In machines, refrigerators, and automobiles littered the streams.

sticks, named for the density of the trees.) Strip and long-wall mining were the cheapest ways to get coal, but they ravaged the landscape and the health of local residents.

I descended into the mines on four occasions. I can recall traveling a mile deep into the earth, transported there by a man car, an open vehicle in which I had to sit in a half-reclining position, so my head wouldn't hit the roof of the mine.

In the mines, the men worked three faces simultaneously. At one, a shooter would drill into the face of the coal seam for three feet, then stuff the hole with dynamite. When ready, an operator would yell, "Fire, fire!" and push the plunger down. A face of loose coal would then tumble down. The shooter would move to another face and repeat the procedure. He was followed by a piece of equipment similar to a huge dust pan, which would pick up the loose coal. After the coal was scooped up, roofers would drill holes in the rock above and insert an iron rod to hold up the roof. Then the whole sequence would resume—dirty and rugged work, but not too dangerous in a well-run mine.

### The Ties that Bind

On my house calls, I repeatedly witnessed the strength of family ties in this part of Kentucky. The county had no nursing home, and the sick and the physically and mentally disabled were often ensconced in the cluttered central room that their families used as a living room, dining room, and kitchen.

I learned a great deal about my patients when I made those house calls—much more than during an office visit. A careful observer can walk into a home, whether in Kentucky or Haiti, and in just a few moments learn a great deal about the patient, the status of his disease, and the quality of his household relationships. I remember one couple, for example, who were in their sixties and suffered from hypertension. I would call on them to monitor their blood pressure. Invariably, I would go into their kitchen to check what was simmering on their stove. Often it was shucky beans with a large chunk of salt pork floating on top.

"This is part of your problem," I would say, poking at the pork.

I learned too what 75 years of dedication by the nurse-midwives had meant to the people of eastern Kentucky. One day, I fielded a call over the short-wave radio from a nurse-midwife who announced, "I'm bringing in a patient with a ruptured ectopic pregnancy!" The nurse soon appeared in her Land Rover, her patient attached to an intravenous line and securely bedded on the floor of the vehicle. The woman's husband was offering her comfort. My interview and exam turned out to be superfluous, because the nurse had coolly brought the situation under control. When I operated, I evacuated considerable blood from the patient's abdomen, clamped and removed the bleeding fallopian tube, closed the abdomen, and reported to the husband. He listened politely, but directed most of his questions to the nurse, as was proper. She was the person he knew, and the one who had intervened immediately to save his wife's life. To him, I was just another pair of hands. ■

*Frank J. Lepreau, Jr. '38 is medical director of the Rose Hawthorne Lathrop Home, a facility for terminally ill cancer patients in Fall River, Massachusetts.*

**OLD KENTUCKY HOME:**  
A typical dirt road in Hyden, Kentucky in 1931. The roads were often muddy and sometimes completely flooded.



f  
by CHRISTINA ANDERSON

FROM HIS FIRST ROTATION AS A YOUNG doctor in a newborn intensive care unit, Nicholas Guerina '83 knew he wanted to specialize in saving babies. Now he is on a mission to lend a hand to infants who need it most—those in poor and war-torn countries.

Guerina spent two months in Albania last spring, taking care of refugees who fled Serb persecution during the conflict in Kosovo and assessing health care needs in the region. His journey began in Kukes, a town bordered by abandoned factories and potato fields at the foot of a small mountain in northeastern Albania. During the conflict, Kukes, ordinarily home to 20,000 people, played host to more than 300,000 Kosovo Albanian refugees. Half of them lived in camps run by various international agencies; the rest were taken in by local families.

The people who lived in the camps, Guerina says, responded to the austere conditions with ingenuity, designing makeshift furniture to make their tents as homey as possible. Although shelling from the Kosovo border served as an audible reminder of the conflict raging around them, life in Kukes was relatively peaceful. "The Kosovo Albanians showed remarkable grace," Guerina says. "I never saw them arguing or outwardly displaying the effects of the tremendous strain."

Livestock and trucks were kept on the outskirts of the camps, and supplies were flown by helicopter to Kukes up to 15 times a day. Each camp had a medical facility, with a doctor-to-patient ratio of one to 500. Guerina, director of perinatal infectious diseases at New England Medical Center's Floating Hospital for Children, shared an apartment in Kukes with three other doctors. The physicians had all come to Albania under the auspices of Child Advocacy International, a British aid organization.

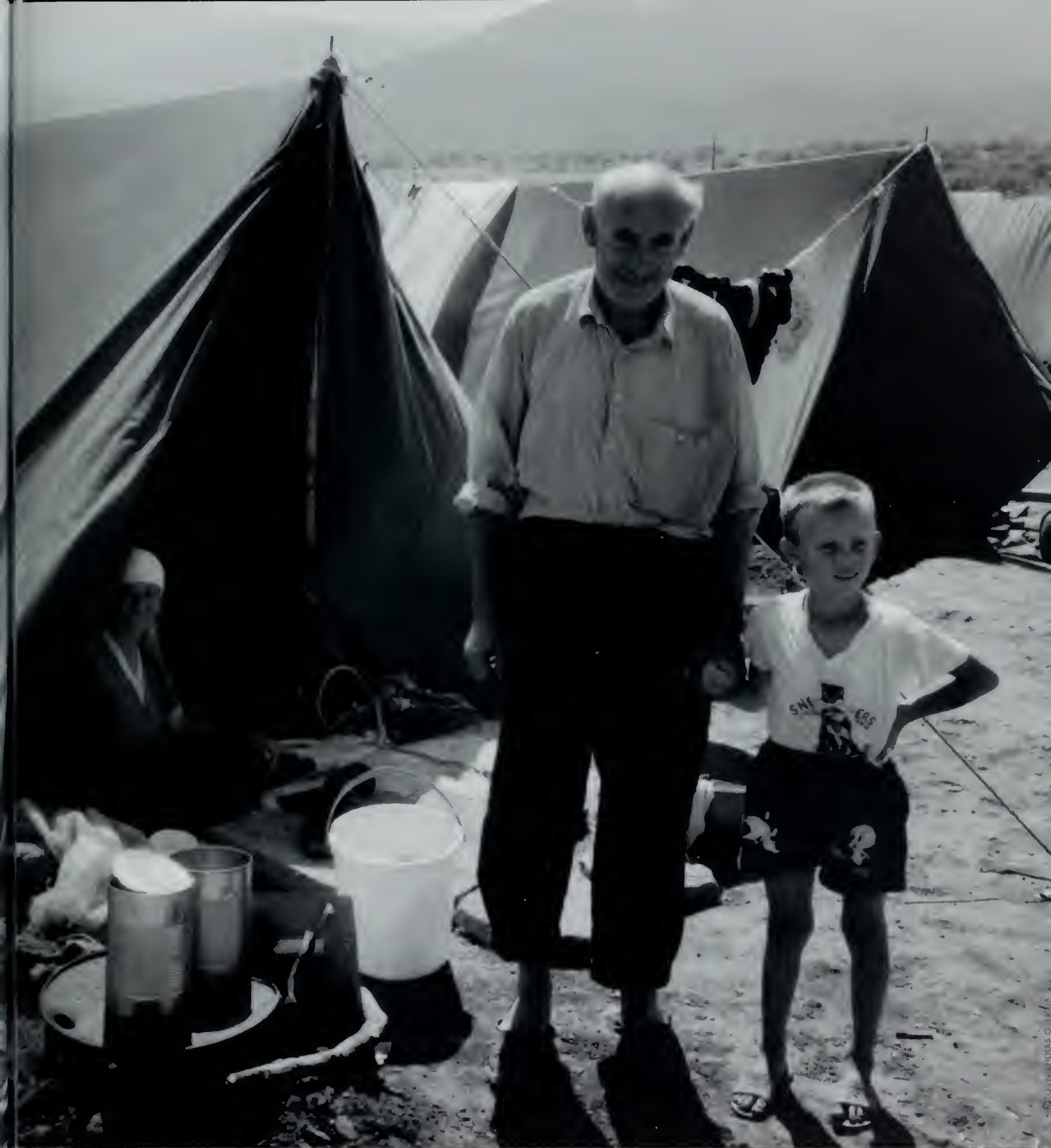
After a morning security meeting, the doctors would make their rounds of the camps and Kukes Hospital. One of



The challenge of ensuring a healthy beginning for babies is heightened in the resource-deprived Balkans

# Special





# deliveries

**FAMILY MATTERS:** A man and his grandson hold hands in front of their tent at "Kukes One," one of seven camps set up for Kosovo-Albanian refugees outside Kukes, Albania. The man's wife sits in the opening of their tent.

the war was over, and they wanted to go home. Within five days Kukes became a ghost town."

their most significant contributions, Guerina says, was setting up a program that encouraged women to breastfeed. Many women had stopped lactating on their journey to the camps and did not know that they could resume. "We were very worried about dysentery spreading," Guerina says, "and the best way to prevent that was with breastfeeding."

Guerina arrived in Kukes with crates of donated supplies, including intravenous catheters and feeding tubes, which he and his colleagues used to teach the medical staff in Kukes how to feed premature babies. The international doctors showed the Albanian hospital staff how to concoct fortified nourishment for babies. "It became clear that very simple interventions could spell a dramatic difference for babies who would otherwise die," Guerina says.

Six weeks after the medical team arrived, the conflict in Kosovo ended and a peace treaty was signed. Guerina recalls with emotion the arrival of NATO troops in Kukes. "Suddenly the town, which already was busy, was inundated with refugees who emerged from houses and tents cheering." By the time the troops were ready to oversee a coordinated reintegration, the refugees had left for the border, piling their belongings onto donkeys and carts. "Nothing could stop them," Guerina says. "The war was over, and they wanted to go home. Within five days Kukes became a ghost town."

Guerina also headed for the border with a group of doctors to assess the medical facilities in Kosovo. There, they encountered dedicated and talented professionals hampered by a shortage of basic, life-saving equipment—much of which had been stolen by departing Serbs. In some cases, Guerina says, the health care workers also lack information. As a result, newborn mortality in full-term babies is almost ten times higher in Albania and Kosovo than in Western Europe and the United States.

### Overcoming Ethnic Divisions

Inadequate equipment and training are major problems in Kosovo, Guerina says, yet they pale in comparison to the more insidious obstacles: prejudice, fear, and hatred stemming from centuries of ethnic and religious disputes. "Another part of our goal is to reintegrate the sides, but it's..." His words trail off as he shakes his head. "They find it very painful to forgive."

This enmity places additional limitations on medical care. For instance, in the town of Mitrovica, a hotbed of eth-



**INNOCENTS ABROAD: A baby sleeps in a bassinet in Kukes Hospital in Albania. Newborn mortality in full-term babies is almost ten times higher in Albania and Kosovo than in the United States.**

nic tension in northern Kosovo, the Ibar River divides the Serb and Kosovo-Albanian populations. Because the hospital lies on the Serb side, when Guerina and his group visited, they were forced to set up a tent to treat the ethnic Albanians. "The hospital normally had 3,600 deliveries a year," he says, "yet they did not have a single patient there, because many of the Serbs had left, and none of the Albanians would see Serb doctors."

The fear and resentment ran so deep that more than one set of parents said that they would let their children die before allowing them to be treated by Serb doctors in Belgrade. The father of a baby who needed a brain shunt to relieve hydrocephalus was adamant that the child not be taken to the capital of Serbia.

"I realized for the first time just how difficult the task in Kosovo was going to be," Guerina says. "The intensity of the animosity between many Kosovo Albanians and Serbs once the refugees returned to Kosovo caught me off guard." Two children died as relief workers tried to organize their transport to a hospital in Macedonia, a more neutral country. The Ministry of Health is now working to staff the medical facilities with members of both ethnic groups.

### On the Home Front

In the quiet, dimly lit newborn intensive care unit at Newton-Wellesley Hospital, where he is on call, Guerina points to a radiant warmer, which contains most of the basic life-support materials he hopes to bring to the Balkans. In contrast to the medical facilities he toured in Albania and Kosovo, in this hospital, storage space is harder to find than supplies. The walls are lined with well-stocked bins containing everything from two-ounce bottles of formula to "small masks" and "teeny tiny masks."

Guerina is called to the delivery room for a Caesarean section. When the team delivers a ten-pound boy, the baby gives out a yell, and a doctor hands him to Guerina and a nurse, who together perform the "pulmonary toilette." They put the infant on the radiant warmer, where he is dried and prodded. Guerina suction amniotic fluid from the boy's nose and mouth and gives him a rapid head-to-toe examination.





**IN SAFE HANDS:** In Boston, Guercina examines a premature infant with respiratory distress syndrome. In Albania and Kosovo, most infants with this condition die.

The delivery team assesses the baby's heart rate and breathing. His oxygen level rises, and his skin flushes from blue to pink. "He is putting up with this sportingly," Guercina says as he inserts a finger in the newborn's mouth to calm him. The nurse attaches a probe that reads the baby's temperature, prompting the warmer to apply just the right amount of heat. Another device on the warmer helps the health care workers assess the baby's Apgar score, which climbs to a healthy nine after five minutes. The boy is swaddled and Guercina hands him to his father.

In this case, the transition from womb to world was smooth. Babies delivered in Albania and Kosovo are not always so fortunate, Guercina says. In many of the hospitals he toured, when problems arise, nurses have to run the babies upstairs. The delay in the babies' treatment leads to a higher frequency of brain damage.

"Although radiant warmers are ideal tools, you don't have to be high tech to get better results," Guercina says. "Our goal isn't to try to provide the Balkan countries with the type of intensive care units we have in the

United States, but to address the easily corrected conditions.

"We can all learn to use our resources better," he adds. "We go through intravenous catheters like they're water, whereas in Kukes, they're like gold."

### A Breath of Life

When he first returned to Boston last summer, Guercina established the Balkan Pediatric Fund to help raise the level of neonatal care in that region. The wealth of technology and experience that exists in the United States, he says, can be shared simply by providing the money to translate a manual and train a few caregivers in key centers who, in turn, will train others. Guercina has already raised enough money to translate into Albanian the *Neonatal Resuscitation Program*, a manual developed by the American Heart Association and the American Academy of Pediatrics to address the most common complication that arises during delivery—depressed or absent breathing. In Albania and Kosovo, as many as two thirds of newborn deaths

or injuries are oxygen-related; implementation of the resuscitation program, Guercina predicts, will have a significant impact on infant mortality and morbidity.

In addition, Guercina helped establish a perinatal-neonatology committee, which will appoint a group of doctors to begin training the delivery room staffs of 35 birthing centers throughout Albania and Kosovo. At least two physicians will be identified in each region to provide ongoing training to as many as 300 caregivers. This model of regionalization, widely used in the United States, is particularly suited to the expensive, cutting-edge technology required in neonatology, Guercina says. His long term goal is to outfit each regional center with life support materials such as oxygen, ventilators, laryngoscopes, intubation materials, and radiant warmers—equipment needed to stabilize a baby before transfer to one of the major children's hospitals in the larger cities.

For now, Guercina says, "we are hoping to help the full-term babies who don't require high-tech interventions. Often all a baby needs coming out of a delivery with respiratory distress is a self-inflating bag." Even in remote villages, where it would be too expensive to supply clinics with oxygen and medication, the resuscitation program will help. The lessons show how to provide adequate warmth, give chest compressions, and use basic equipment such as breathing bags and masks. "It sounds so simple," Guercina says, "and, in fact, it really is, but if you don't memorize the steps, problems arise no matter how experienced you are."

Despite the tension in the region, Guercina says, both the Albanian manual and a version that had already been translated into Serbo-Croatian have been well received and may even do more than raise the standard of care. "Medicine is one of the areas in which you have the potential to foster understanding between different groups, because health is a common language," Guercina says. "Through that language, there's a real opportunity to cultivate peace as well." ■

*Christina Anderson is a freelance writer based in Somerville, Massachusetts.*

## Prentiss L. Hyder

**1933** received the annual Physician Leadership Award from the Christus Spohn Health System in March 2000. Hyder was honored for the service he has provided to the Corpus Christi, Texas community since 1938. The award dinner was held at the Corpus Christi Country Club.

## Carter R. Rowe

"I retired in 1991 from active practice at the Orthopedic Service at Massachusetts General Hospital and HMS. Mary and I continue in good shape."

## Carl E. Taylor

**1941** "I have returned from a Nepal expedition during which we walked from the Indian border to the Tibetan border. We repeated a health survey done 50 years ago—the first ever done in Nepal—in the same villages. We were remembered because we were the first expedition permitted into the interior two years before Nepal opened up to the outside world. The changes are amazing, especially in health, and not all good."

## Charles O. Carothers

**1946** "My grandson, Joshua T. Carothers, is in his second year of medical school at the University of Cincinnati. He will represent the fifth generation of the Carothers family to graduate in medicine."

## Howard M. Spiro

**1947** "I have joined the private sector as a part-time consultant in New Haven, now that I have retired from Yale after 44 years."

## Morgan Vigneron

**1949** "I am still savoring our wonderful 50th reunion. Congratulations to Tom Parker and Lee Walton for their inspiring fundraising from our famous class. On to the 55th!"

## Harvey Rothberg

**1953** "I'm as busy as ever in internal medicine-oncology practice in Princeton, New Jersey, but I am looking forward to retirement in June 2000."

## Bernard Kliman

**1955** "My full retirement begins with the new century. I hope to travel more with Phyllis and to visit with the grandchildren, Marissa and Amanda. It was a chore to have prostatic cancer, now cured by surgery. That experience convinced me to retire for the second time from active endocrinology and to follow medical advances as an observer. I'm looking forward to our 45th reunion."

## John J. Ross

**1956** "I was just notified by the dean that I have been

appointed professor emeritus in the Department of Pediatrics at the University of Florida College of Medicine after serving the institution for 34 years as chief of pediatric neurology and program director."

## Sanford I. Roth

"I have finally pulled the trigger and retired as a professor and assistant dean for admissions at Northwestern University Medical School. We are moving to Chatham, Massachusetts to our new house, which we spent the last one and a half years building. We will be glad to see classmates."

## George J. Hill II

**1957** "In May 1999 I received my master's degree from Rutgers University in the field of the history of science, medicine, and technology. I am now continuing my study of history as a full-time graduate student for a PhD at Drew University in Madison, New Jersey."

## John A. Retzlaff

"We are enjoying our new home in Medford, Oregon. We have plenty of room for guests—come visit us!"

## Sheila B. Blume

**1958** "I am happily semi-retired, working on legal cases, teaching, and consulting. I am also painting quite a lot."

## Robert S. Rosson

"As of January 2000, I decreased my gastroenterology practice to three days a week. I've been looking forward to more time with Eileen and the family and







**Harvard Medical Alumni Association**

25 Shattuck Street  
Boston, Massachusetts 02115  
Change Service Requested

**Non-Profit Organization**

U.S. Postage PAID  
Permit No. 52420  
Boston, MA